LANDAUER®

microStar Reader Quality Assurance Program

Medical Dosimetry Users

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Overview

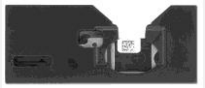
- **Introduction**
  - How does OSL dosimetry work ?
  - MicroStar Reader Characteristics
  - nanoDot Dosimeter Characteristics
- **MicroStar Reader QA Program**
  - Manufacturing Tests
  - Installation Testing
  - Calibration
  - Daily QC
  - Preventive Maintenance
  - Available Resources
- **Troubleshooting, Customer Support & Service**

INTRODUCTION

Introduction: The MicroStar Reader + Dosimeters

Patient Dosimetry QA

nanoDot Dosimeter



nanoDot Dosimeter
+ reader adapter

Environmental + Occupational Dosimetry

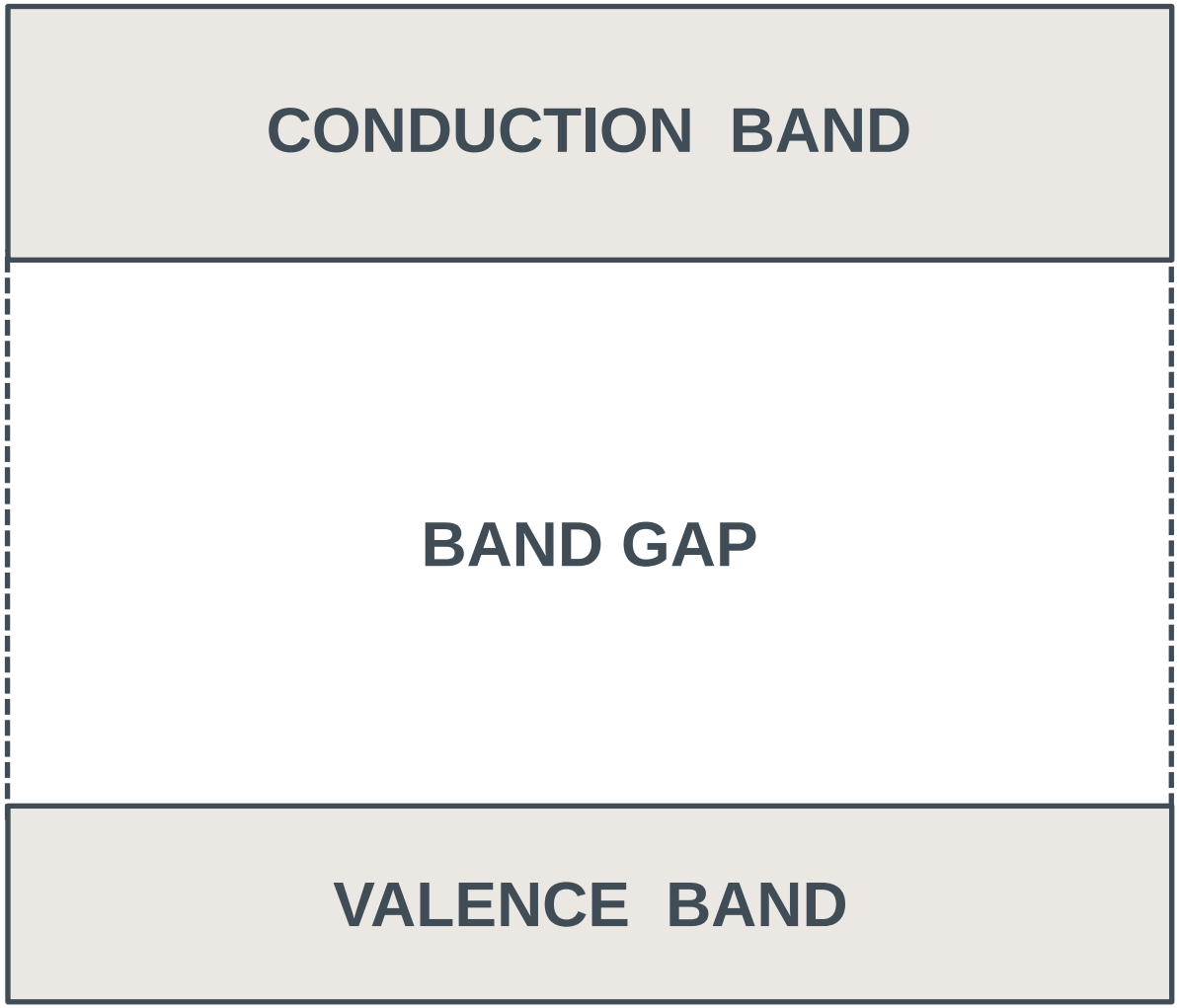
InLight Dosimeter

InLight Type 2 Personnel Dosimeter

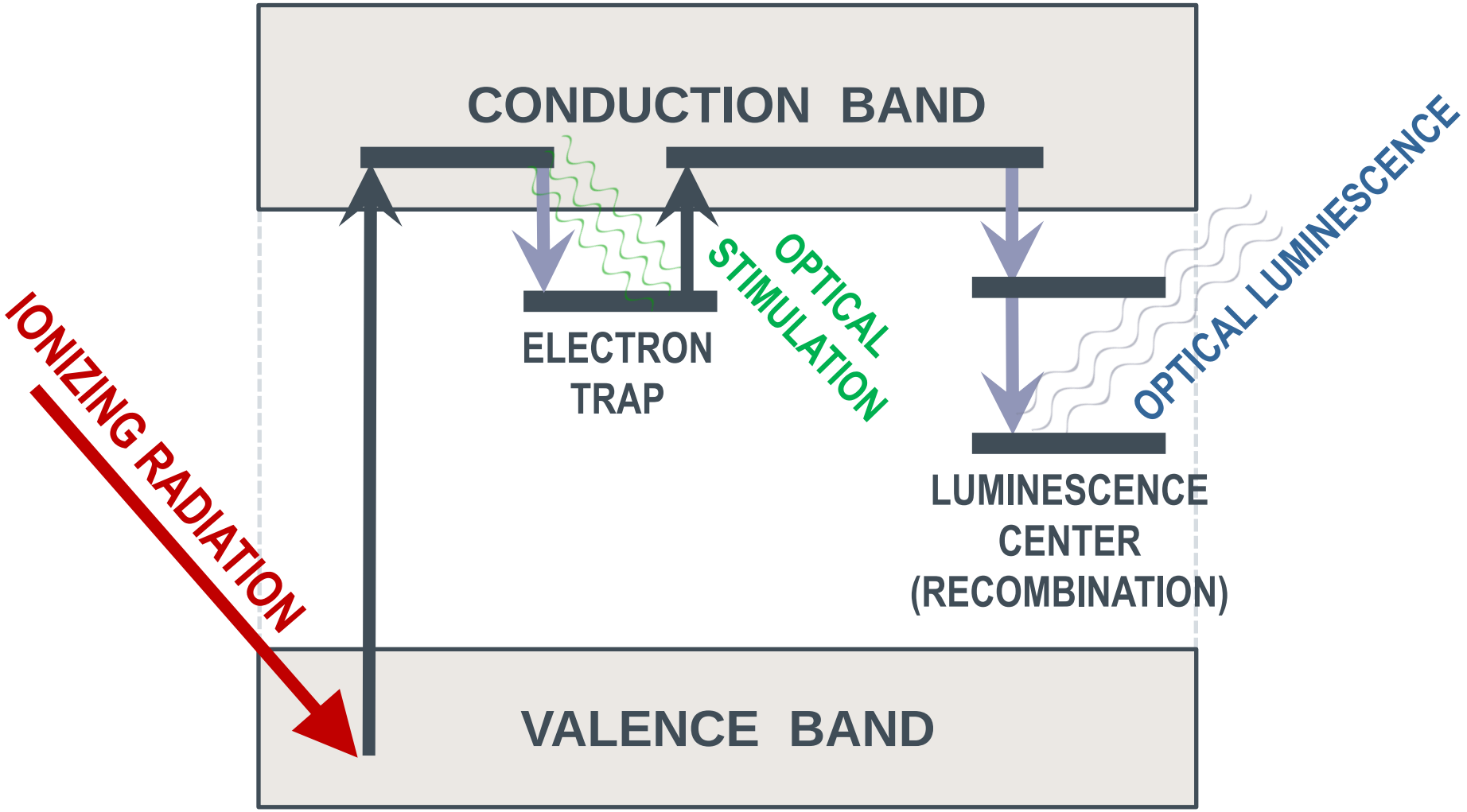
The microStar reader and associated dosimeters utilize optically-stimulated luminescence (OSL) dosimetry technology.

What is Optically-Stimulated Luminescence (OSL) ?

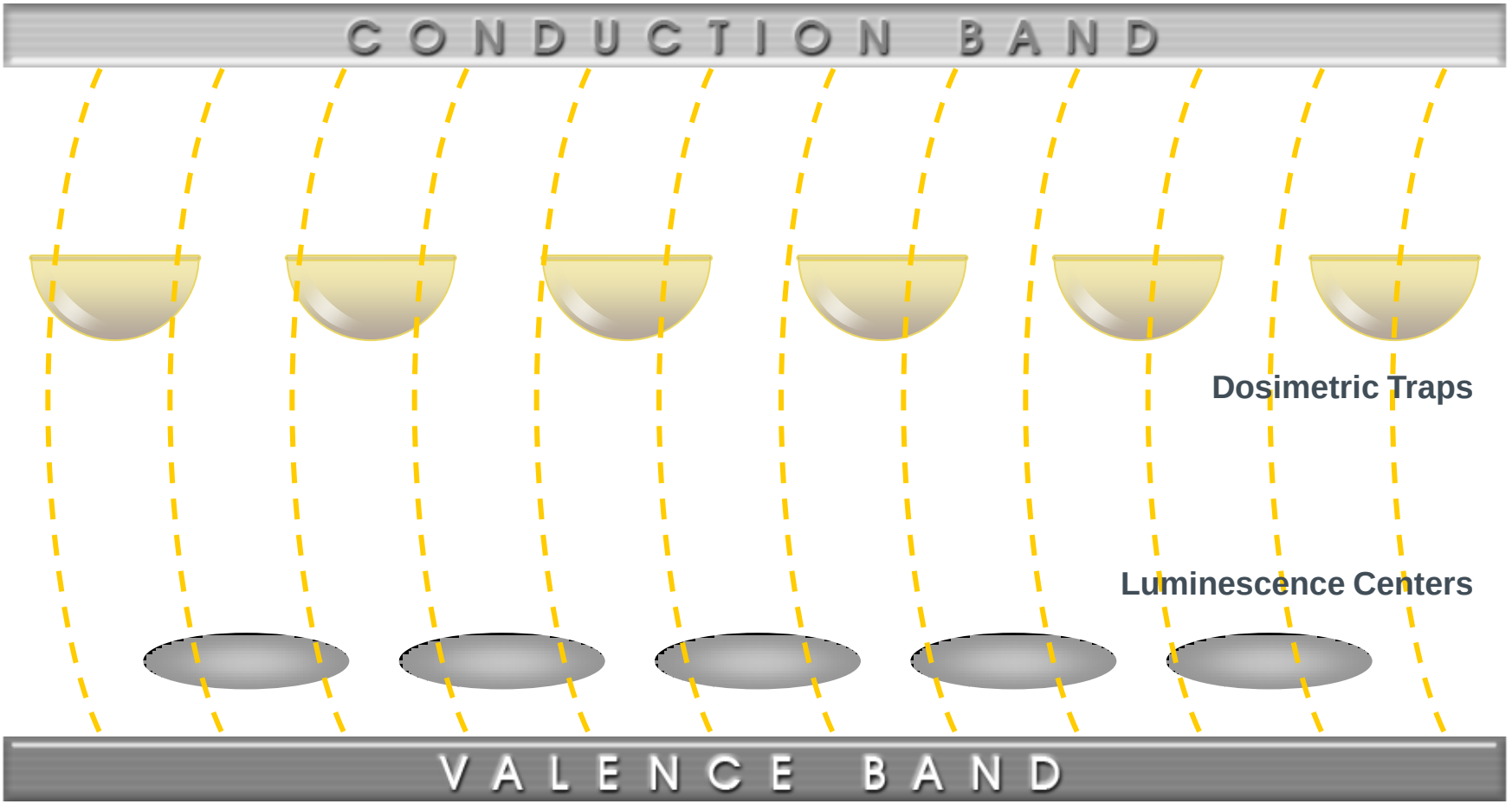
Introduction: How does OSL dosimetry work ?



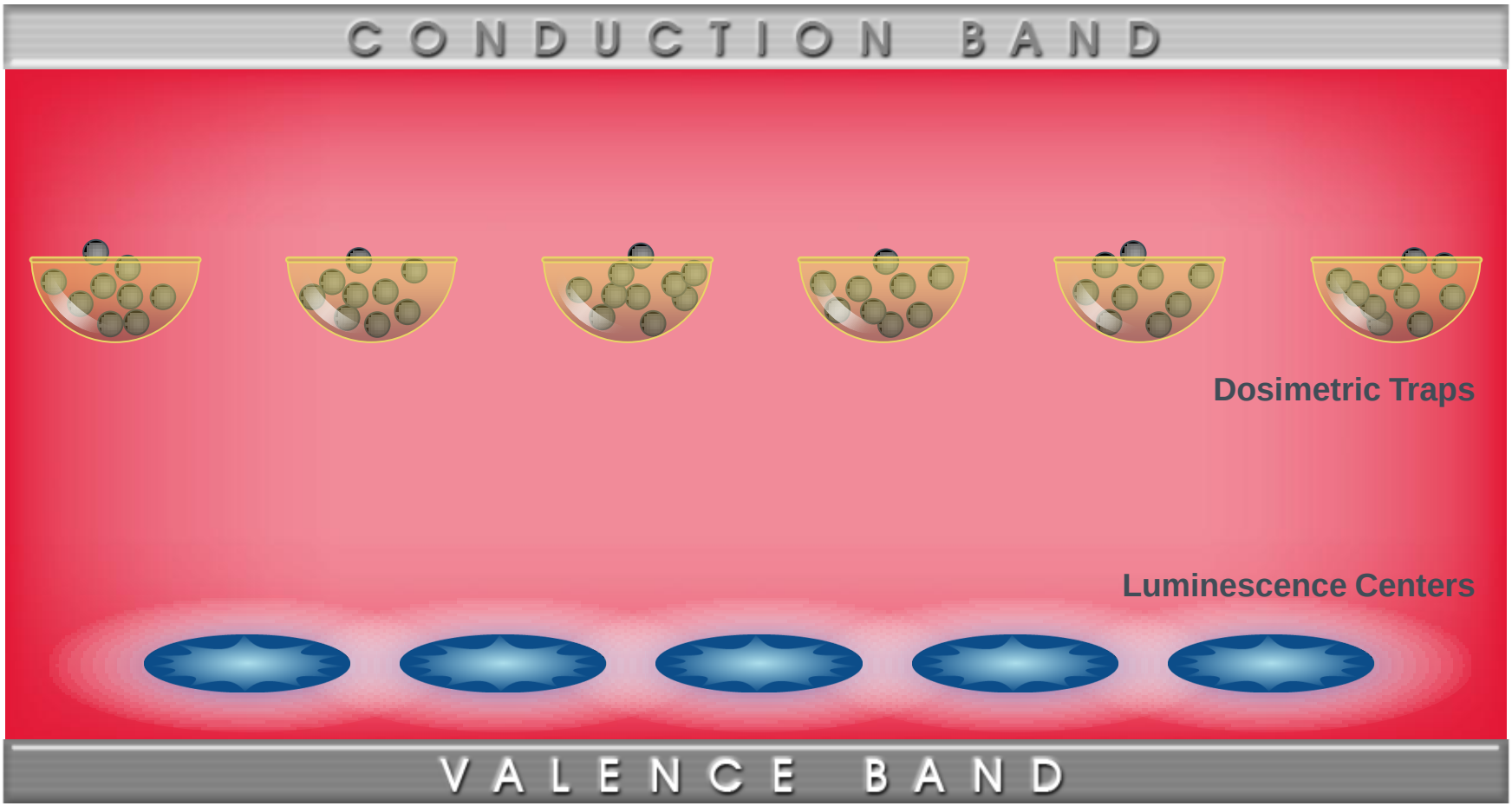
Introduction: How does OSL dosimetry work ?



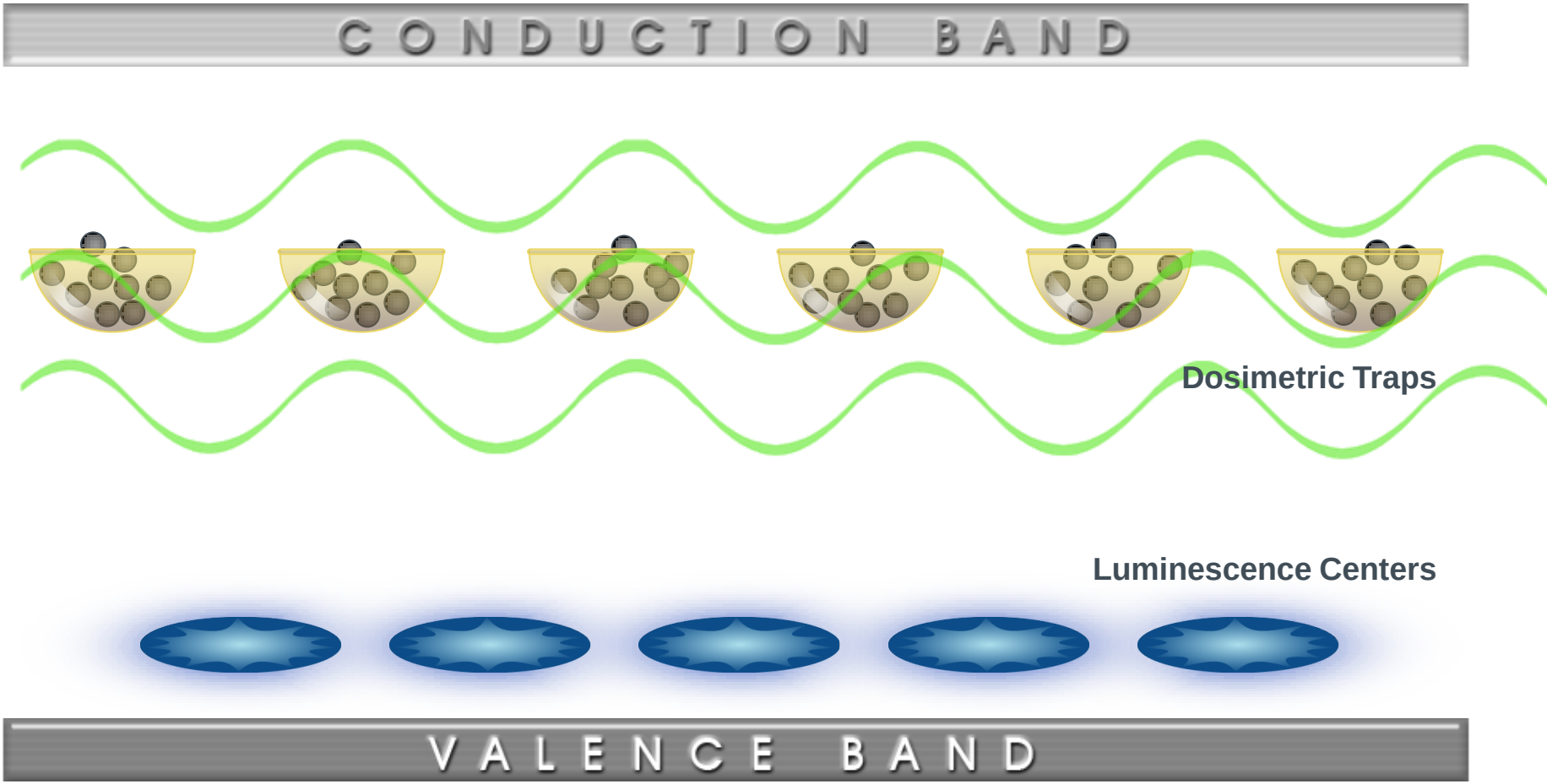
Physics of Luminescent Dosimetry: Irradiation



Physics of Luminescent Dosimetry: Thermal Stimulation



Physics of Luminescent Dosimetry: Optical Stimulation



Physics of Luminescent Dosimetry: OSLD vs. TLD

	OSLD	TLD
Dose Deposition	Electron/hole capture at site of dosimetric traps in crystalline structure	Electron/hole capture at site of dosimetric traps in crystalline structure
Readout Mechanism	Optically-Stimulated Luminescence	Thermally-Stimulated Luminescence
Precision	Very good	Very good*
Accuracy	Very good to Excellent	Very good*
Readout speed	Fast	Slow
Re-read capability	Multiple re-reads	None, single-read only
Operational overhead (man-hours, equipment)	Low	High

** Requires very stringent procedural controls to achieve good results*

Physics of Luminescent Dosimetry: Electron Transitions

A: Exposure + Charge separation: electron moves from valence band to conduction band

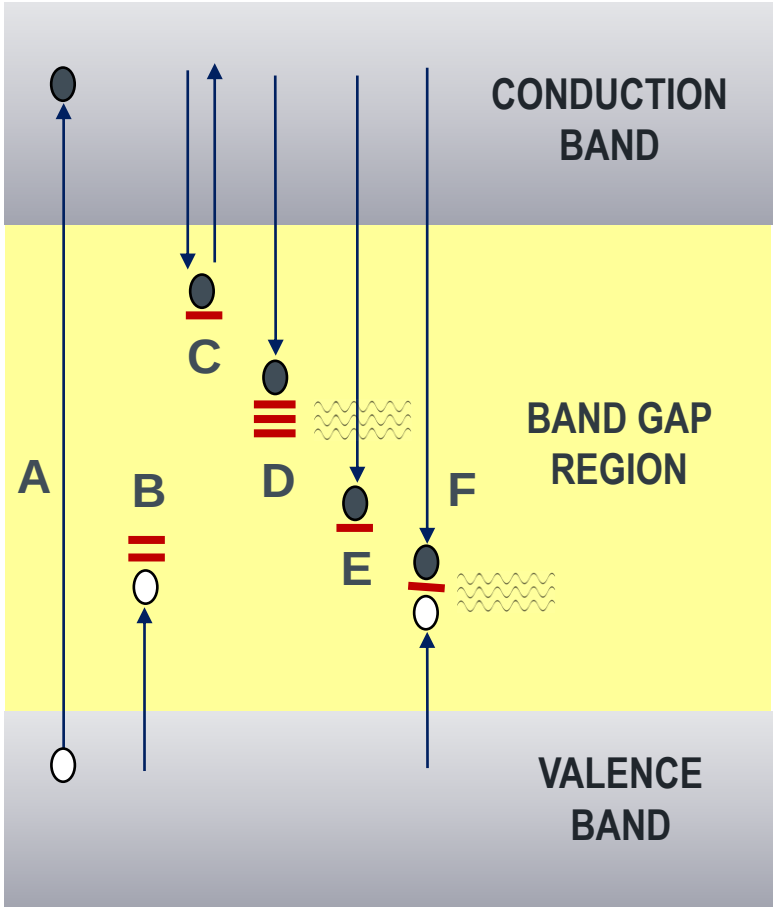
B: Trapping of a hole at a deep hole trap.

C: Electron capture/release at a superficial level electron trap (unstable at ambient temperatures , lifetime: sec. to min.).

D: Electron capture at medium level "dosimetric" trap, released by applying optical stimulation.

E: Electron capture at deep level trap; released only with high temperatures or UV light.

F: Recombination of a hole and an electron and emission of light at a luminescence center



Physics of Luminescent Dosimetry: Stimulation Modes

OPTICAL STIMULATION MODES: (POSL vs. CW-OSL)

Pulsed Optically Stimulated Luminescence (P-OSL) readers utilize a pulsed light source (laser or LED) and although accurate, are costly to manufacture due to gating electronics, high power laser cost, etc…

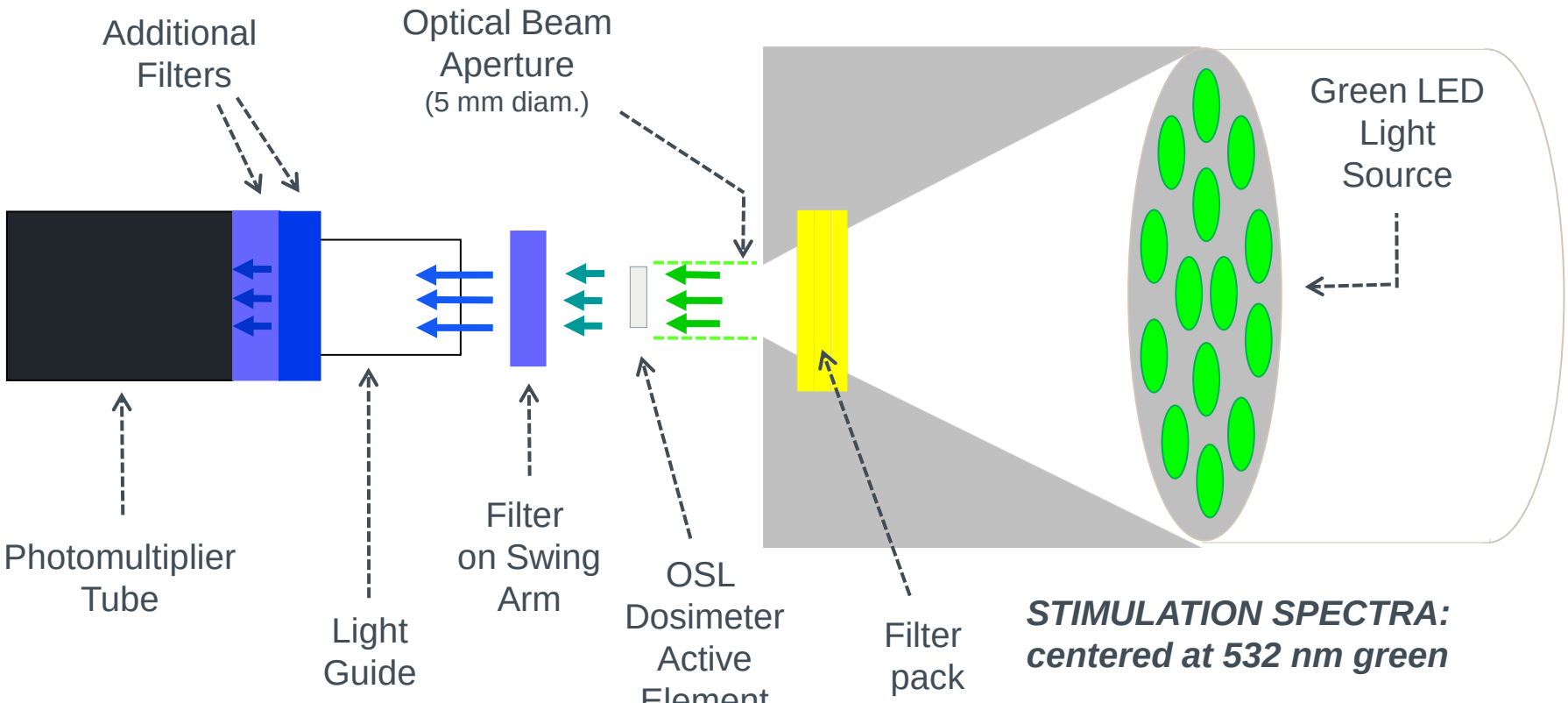
- stimulation and emission spectra are temporally-separated

Continuous Wave Optically Stimulated Luminescence (CW-OSL) readers employ Light Emitting Diodes (LEDs) that illuminate the Al_2O_3:C dosimeter continuously during readout.

- cost effective: use inexpensive LEDs and do not require gating circuitry
- optical filtration removes the majority of stimulation spectral components that would otherwise be transmitted and included in the emission (luminescence) spectra

Characteristics of the MicroStar Reader: How it works

EXPANDED SCHEMATIC VIEW: OPTICAL CHAIN

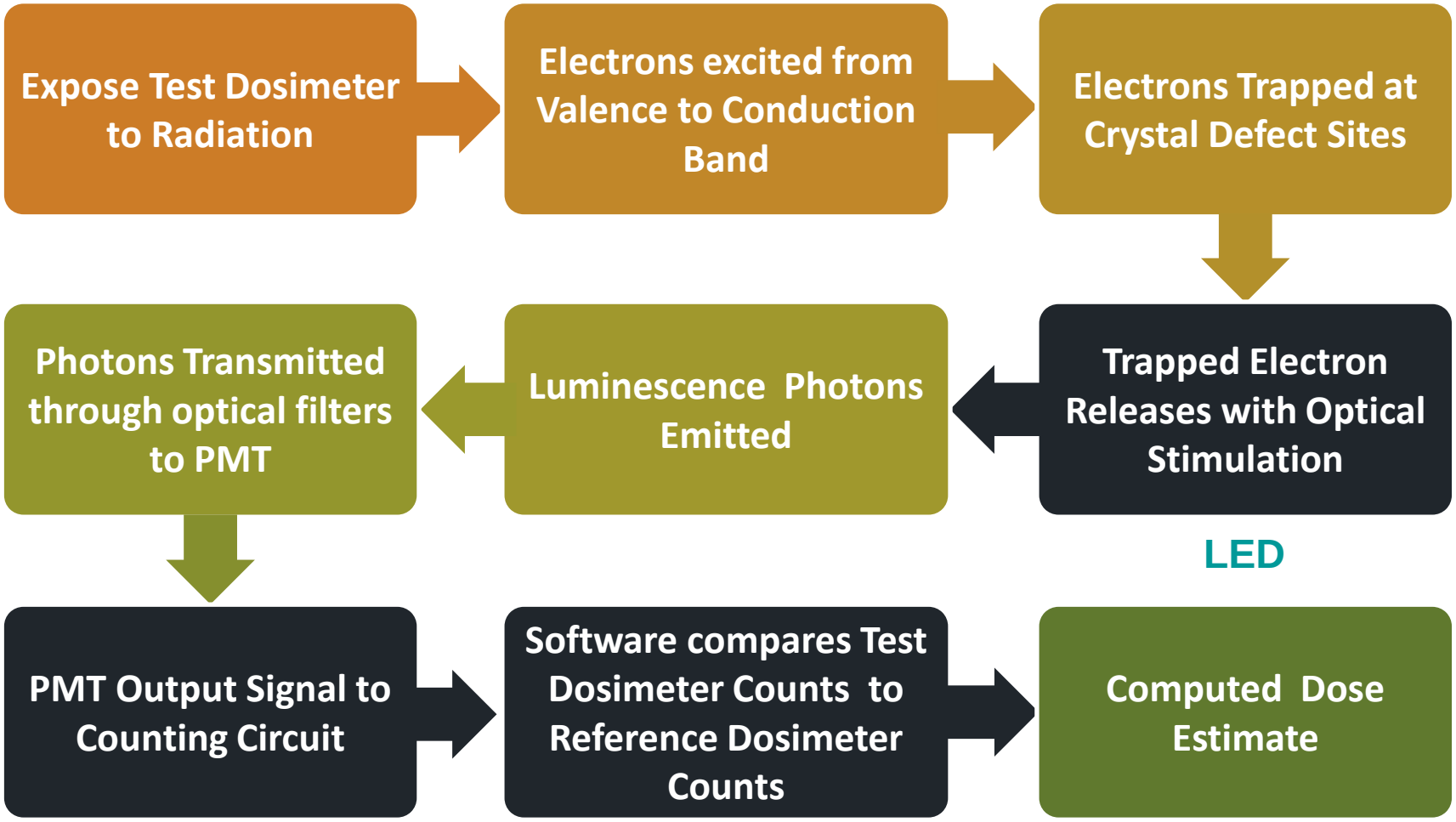


STIMULATION SPECTRA: centered at 532 nm green

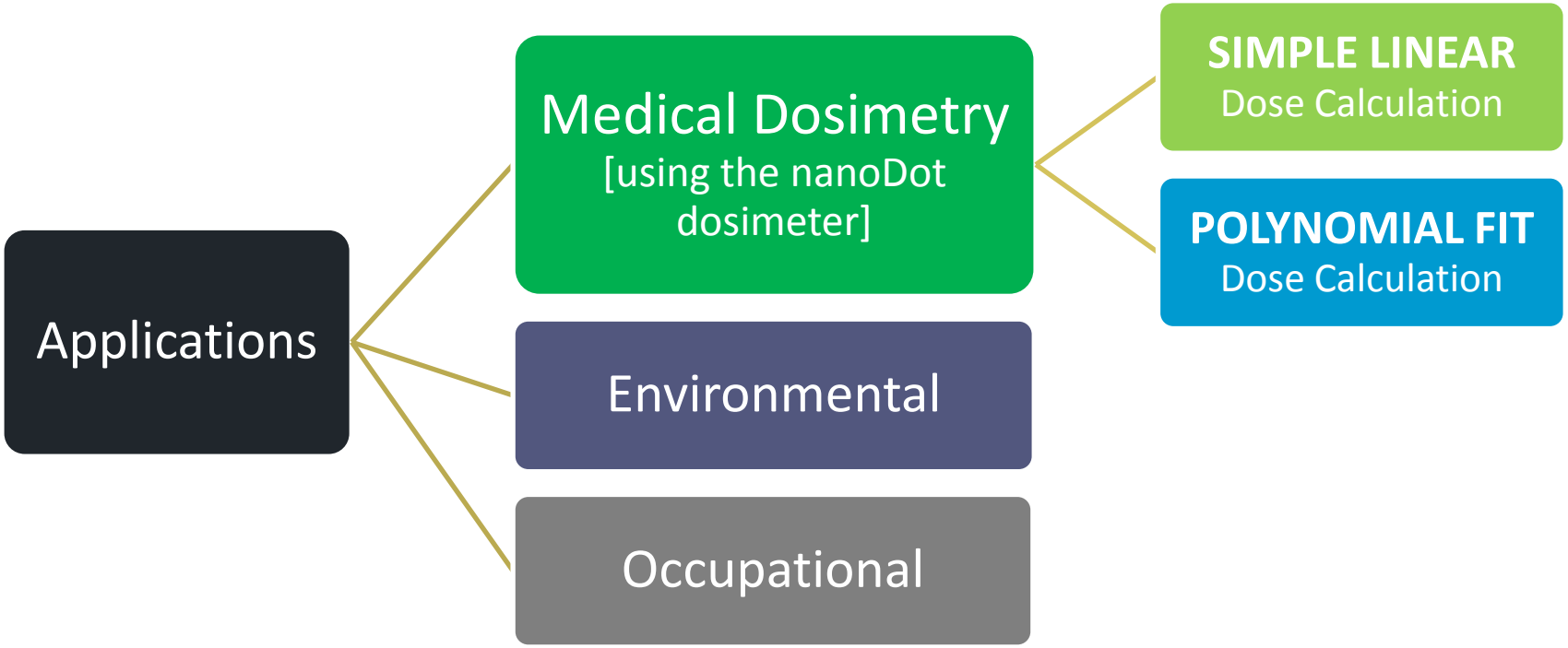
EMISSION SPECTRA Centered at: 420 nm blue

Further details of filter specifications:
Medical Physics, Vol. 34, No. 12, December 2007

Characteristics of the MicroStar Reader: How it works



Characteristics of the MicroStar Reader: How it works



The signal from the test dosimeter is compared against that of calibration references that are independently verified (and ideally NIST-traceable). For best results the test and reference dosimeters should be irradiated under comparable conditions (radiation quality, geometry relative to source and scattering conditions, etc…).

Characteristics of the MicroStar Reader: How it works

When the LINEAR CALIBRATION mode is enabled when reading test dosimeters, the DOSE is computed using the following expression:

$$\text{Dose(cGy)} = \frac{\text{PMT\_Counts}}{\text{CALFACTOR(counts/dose)} \bullet \text{SENSITIVITY}}$$

PMT_Counts are background-corrected (as necessary)

SENSITIVITY is the "relative" EFFICIENCY of the TEST dosimeter in comparison to the reference population and is a dimensionless factor

Characteristics of the MicroStar Reader: How it works

THE LINEAR CALIBRATION FACTOR IS GIVEN BY THE FOLLOWING:

$$CALFACTOR = \frac{1}{L}\sum_{l=1}^{L}\frac{1}{E_1}\left(\frac{1}{N*R}\sum_{n=1}^{N}\sum_{r=1}^{R}\frac{C_{n,r,l}}{S_n} - BKGD_{avg}\right)$$

where: $$BKGD_{avg} = \frac{1}{N*R}\sum_{n=1}^{N}\sum_{r=1}^{R}\frac{C_{n,r,l_0}}{S_n}$$

E = Dose

l = l^{th} dose level, l=1...L where L = # dose levels in the range

l_0 = 0^{th} dose level for unexposed dosimeters

n = n^{th} dosimeter, n=1…N where N = # dosimeters per dose level

S_n = sensitivity of n^{th} dosimeter

r = r^{th} dosimeter reading; r=1…R where R=# of readings per individual dosimeter

$C_{n,r,l}$ = r^{th} reading of n^{th} dosimeter at l^{th} dose level

C_{n,r,l_0} = r^{th} reading of n^{th} dosimer at "unexposed" dose level

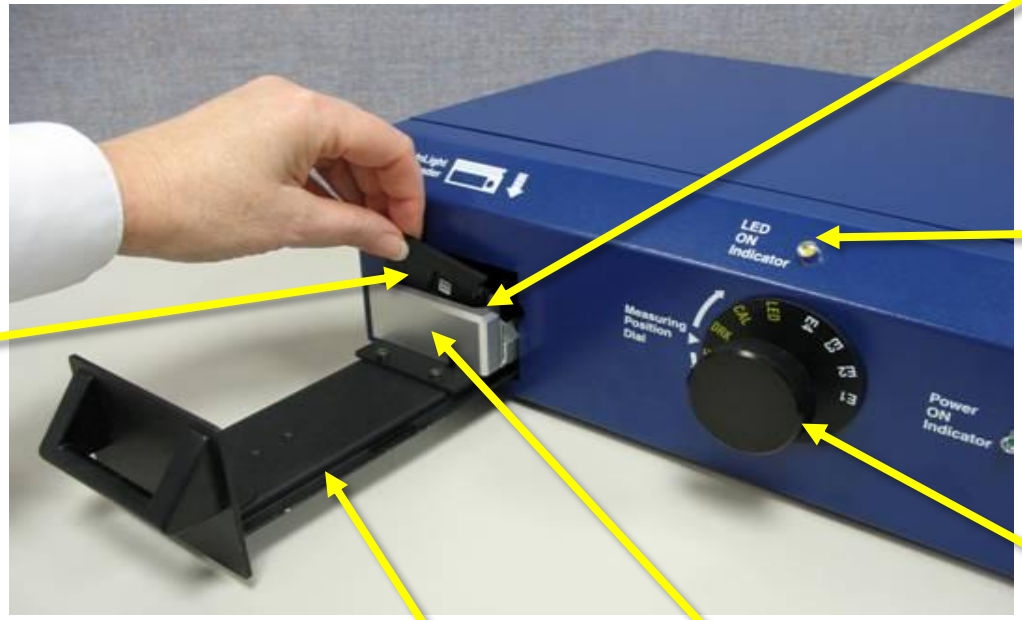
Characteristics of the MicroStar Reader: How it works

UNDERLYING ASSUMPTIONS

1. "Unexposed" test and/or Calibration reference dosimeters are read prior to use to ensure no significant accumulated dose due to natural background or inadvertent exposure.
2. Test and Calibration dosimeters are exposed under comparable conditions, i.e. radiation energy & exposure geometry/conditions.
3. Test dosimeters have been read at least 10 minutes after irradiation and before signal fading effects might impact accuracy.
4. Reader response is required to be relatively constant over time. Must maintain stable temperature environment, monitor performance metrics, and recalibrate reader as necessary.

Characteristics of the MicroStar Reader

HARDWARE OVERVIEW: EXTERNAL



Carrier Plate

LED "ON" Indicator Light

Adapter or Holder

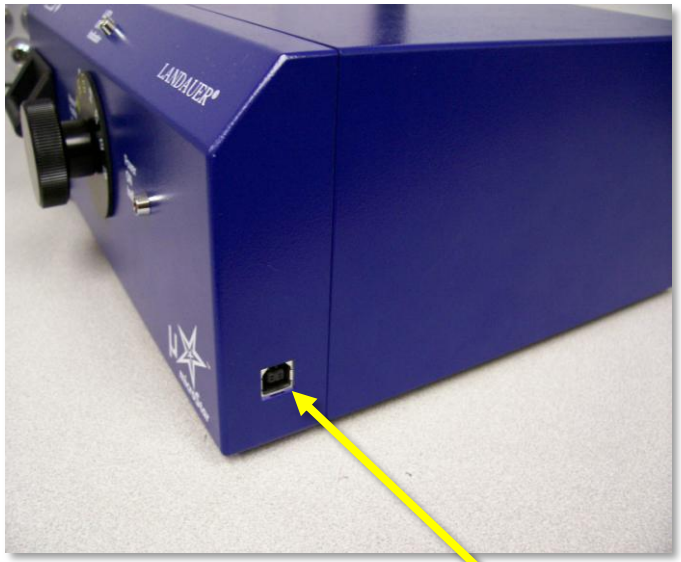
Measurement Dial

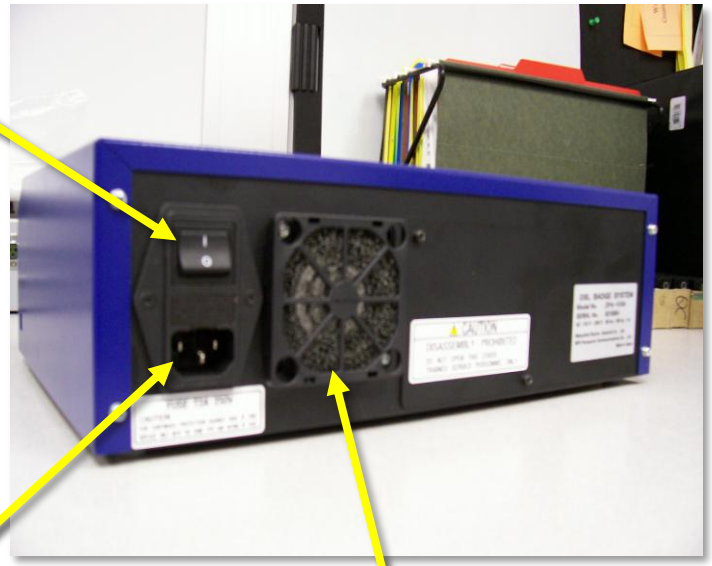
Tray Drawer

Carrier

Characteristics of the MicroStar Reader

HARDWARE OVERVIEW: EXTERNAL

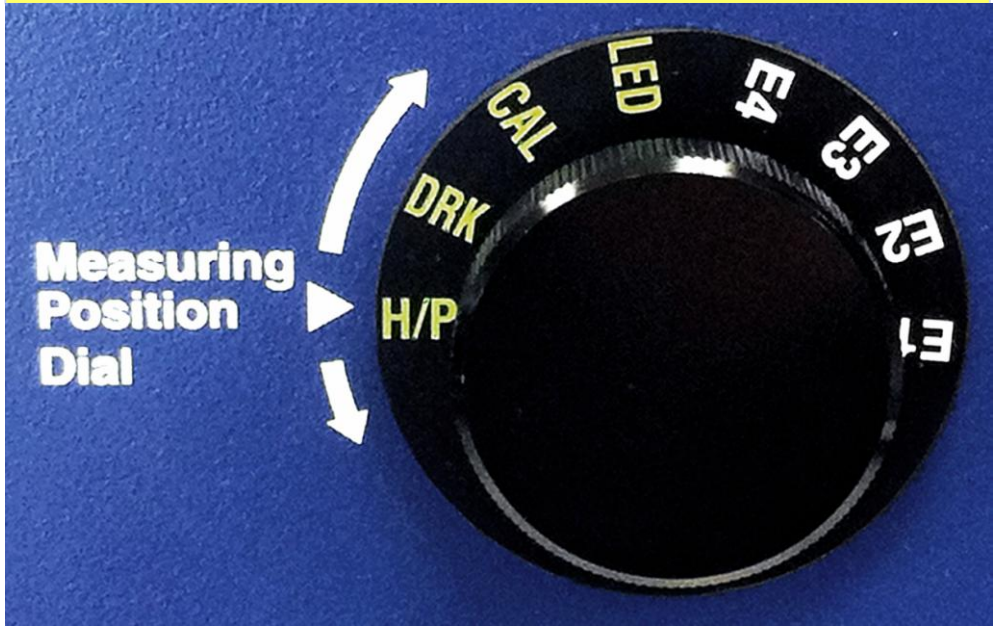




Characteristics of the MicroStar Reader

HARDWARE OVERVIEW: EXTERNAL

H/P: Home Position (START)



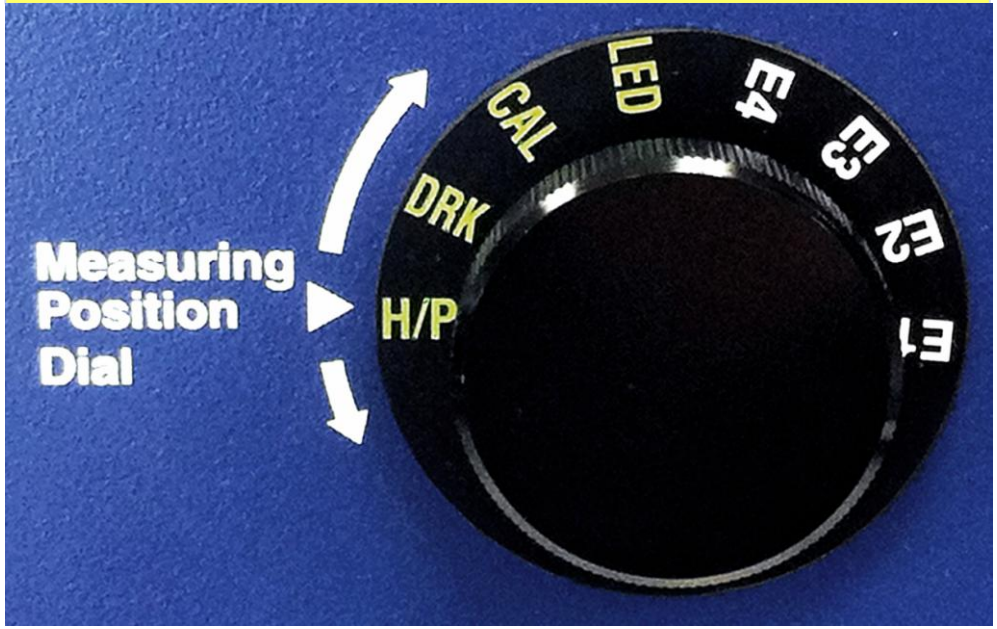
To acquire a single reading of a nanoDot :

1. Rotate dial CLOCKWISE (right) so that arrow points from H/P to E1.
2. Pause until LED ON Indicator turns off
3. Rotate back COUNTER-CLOCKWISE (left) back to the home position H/P.

Characteristics of the MicroStar Reader

HARDWARE OVERVIEW: EXTERNAL

H/P: Home Position (START)



To acquire a series of reader Standard Measurement (DRK, CAL, LED) readings:

1. Rotate dial COUNTER-CLOCKWISE (left) from home position (H/P) to DRK, CAL & LED, pausing 1 second at each position until the LED ON Indicator light turns off
2. Rotate the dial CLOCK-WISE (right) back to the home position H/P.

Characteristics of the MicroStar Reader

STANDARD MEASUREMENTS

INTRINSIC reader performance metrics that are designed to reflect the reader response stability by assessing the PMT signal in response to “STANDARD” stimuli. They do not fully represent the conditions under which medical dosimetry measurements with a nanoDot are taken and therefore should NOT be used to adjust or correct readings.

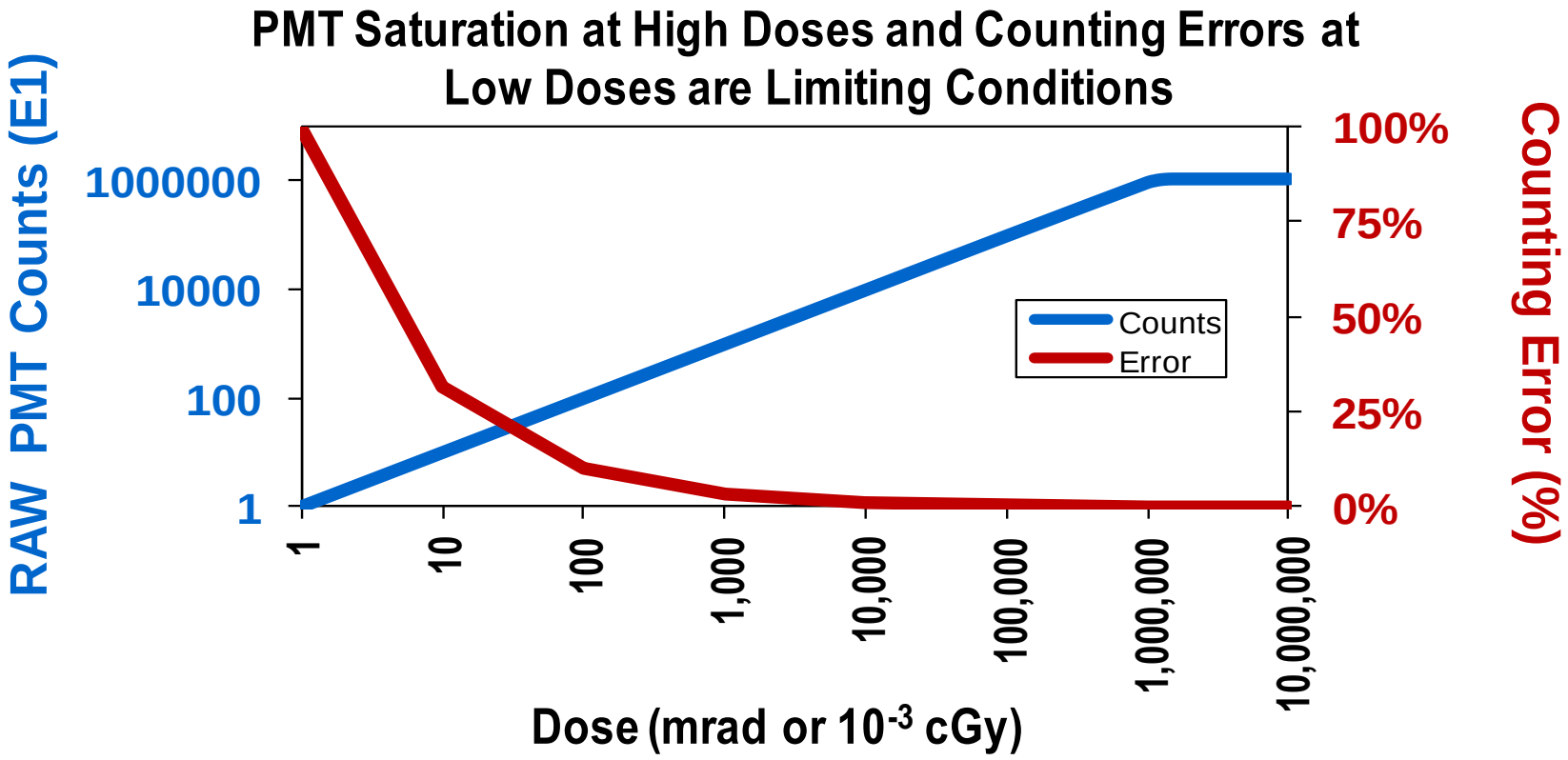
DRK: PMT response to NO stimulus which is an indicator of electronic noise or “dark current”.

CAL: PMT response to a small exempt quantity of C-14 ($T_{½}$ = 5730 years) encapsulated in a powdered phosphor

LED: PMT response to the LED source used to stimulate OSLDs during readout but with filter closest to the LED retracted.

Characteristics of the MicroStar Reader

OPERATING RANGE & PMT GAIN



Characteristics of the MicroStar Reader

SOLUTION: DYNAMIC RANGE CONTROL

Range of the PMT is extended by using two different operating (gain) modes with different optical stimulation levels: WEAK BEAM (High Doses) & STRONG BEAM (Low Doses); Cross-Over-Point (COP) defines transition between both operating ranges. Range is selected "on the fly".

When a test dosimeter is analyzed:

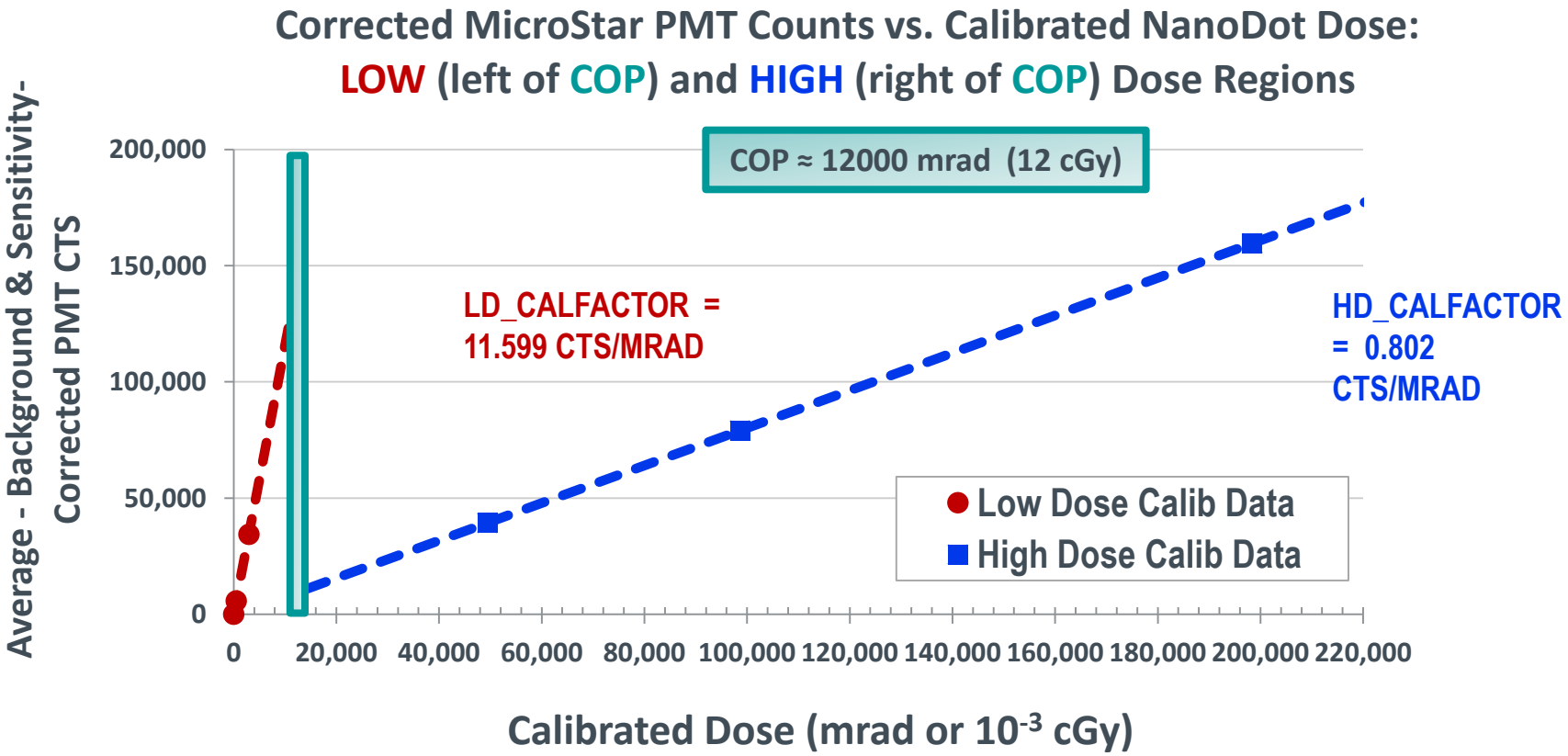
- The PMT counts obtained with a brief (0.1s) flash of light (same as pretest counting duration) are compared with the pretest counts obtained at the cross-over point (COP) dose to determine if the "Weak" beam or the "Strong" beam readout mode is to be used.
- The appropriate level of stimulation (Weak or Strong) is then selected and applied for a duration of 1.0 second during which the luminescent signal is collected.

Provides for a wide dynamic range

- 5 mrem LLD (Occupational Dosimetry) to 15 Gy (Radiation Oncology)

Characteristics of the MicroStar Reader

READER RESPONSE & CROSS-OVER-POINT (COP)



Physical Characteristics of the nanoDot OSL Dosimeter

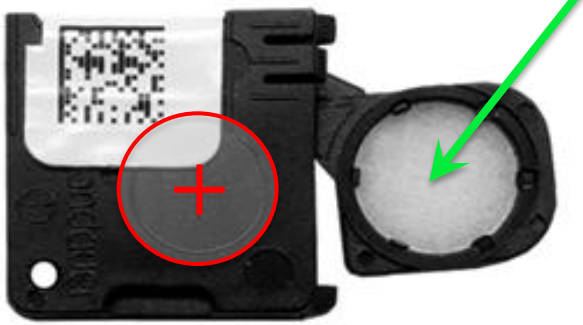
How is the nanoDot manufactured ?

- High purity Al_2O_3 is melted at high temperatures and recrystallized after the addition of dopants, resulting in the formation of oxygen vacancies, thus creating a unique crystalline structure that is able to trap electrons released from the valence band when the crystal is exposed to radiation.
- The Al_2O_3:C is then formulated as a powder mixed with a liquid binder, before being coated onto a base material and sealed with a transparent film tape. Individual nanoDots are punched out from these rolls of Al_2O_3:C and are then encapsulated in a plastic light-tight case.

Physical Characteristics of the nanoDot OSL Dosimeter

OPEN

BAR CODE



FRONT

OSL Dosimeter:
Disk of Al_2O_3:C
4 mm diameter
0.3 mm thick
(of which 0.2 mm is Al_2O_3:C)
ρ = 3.95 - 4.10 g/cm^3

nanoDot Outer Case:
Square- ABS Plastic
10.0 x 10.0 mm
2.0 mm thick
(0.36 mm thick above/below Al_2O_3:C)
ρ = 1.03 g/cm^3

CLOSED

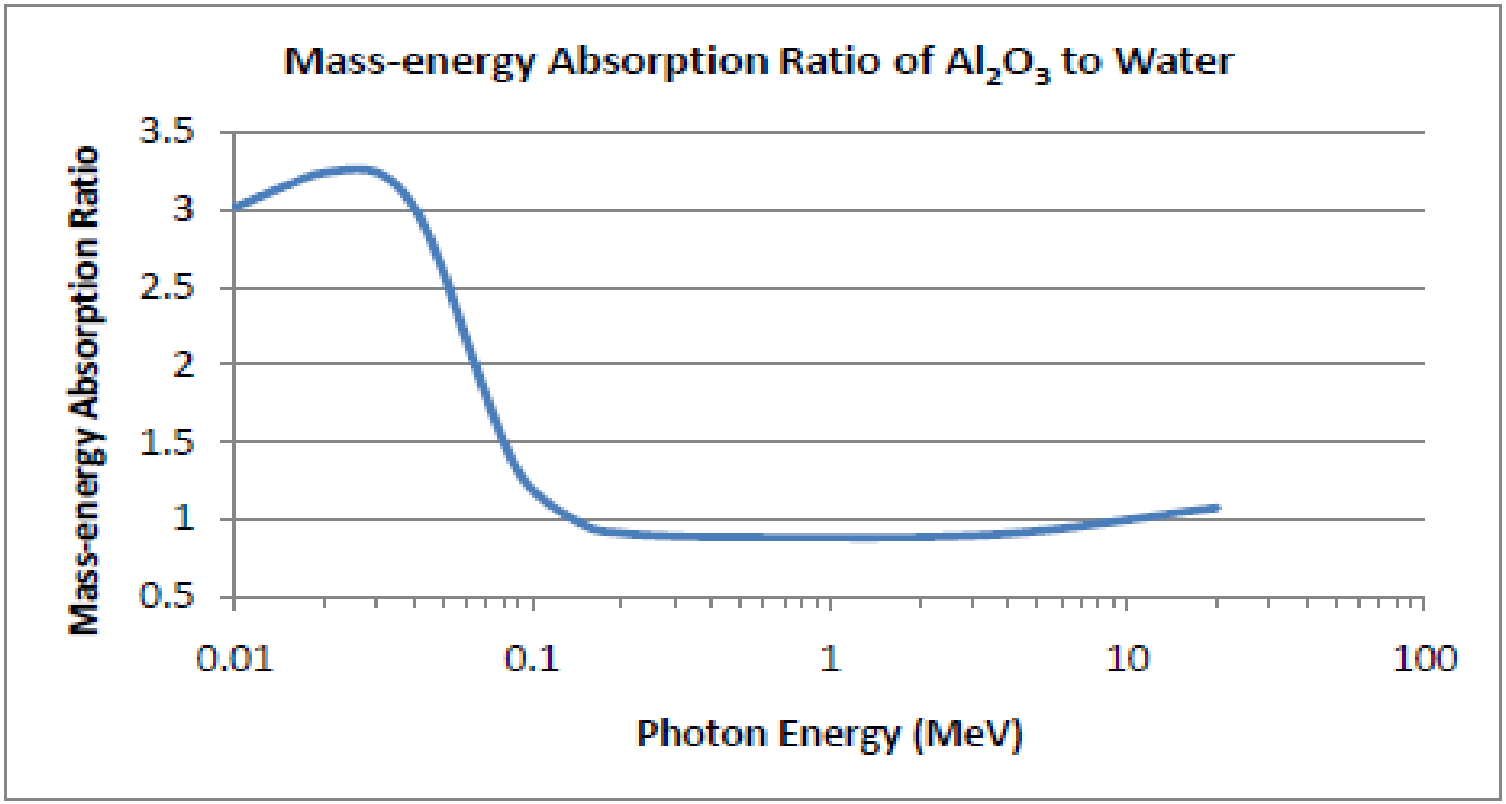
SERIAL #

BACK

NOTE: Asymmetric position of dosimeter within case

Dosimetric Performance of the nanoDot OSL Dosimeter

RESPONSE RELATIVE TO WATER



Kerns / RPC

Dosimetric Performance of the nanoDot OSL Dosimeter

NANODOT SENSITIVITY LABELING

Serial #: DN091042837

Sensitivity = 0.91

The 3 digits appearing after the two-letter Alphabetic code (e.g. “DN”) designate the nanoDot labeled sensitivity which is used in the reader dose calculation and is now decoded automatically by the v4.3 software when the nanoDot barcode serial number is scanned when performing a reading.

Dosimetric Performance of the nanoDot OSL Dosimeter

GENERAL PURPOSE (GP) VS. SCREENED NANODOTS

For **General Purpose (GP) nanoDots** the sensitivity is assigned based on the *POPULATION*, i.e. the measured average sensitivity of the OSL roll from which nanoDots are extruded; all nanoDots originating from the same roll are assigned the same sensitivity value (but have unique SNs).

For **Screened (S) nanoDots** the sensitivity is based on an *INDIVIDUAL* test nanoDot's measured sensitivity wherein the nanoDot's response to a calibrated (NIST-traceable) exposure at 5 Rads (Cs-137; 662 keV) is compared with that of REFERENCE nanoDots whose sensitivity is known to a high degree of accuracy & precision. The test nanoDot is then labeled, re-exposed and re-read to verify the labeled sensitivity, then annealed prior to release to inventory.

Dosimetric Performance of the nanoDot OSL Dosimeter

SCREENED NANODOT SENSITIVITY ASSIGNMENT

$$S_n = \sum_{r=1}^{R} \frac{CT_{n,r}}{R} \Big/ \sum_{m=1}^{M} \sum_{r=1}^{R} \frac{CREF_{m,r}}{S_m \times R \times M}$$

CT: raw counts TEST nanoDots
CREF: raw counts TEST nanoDots
n: n^{th} test nanoDot dosimeter
m: m^{th} reference dosimeter
M: total # reference dosimeters
S_n: sensitivity of n-th TEST nanoDot
S_m: sensitivity of m-th reference dosimeter
r: r^{th} reading for single dosimeter
R: total # reading repetitions

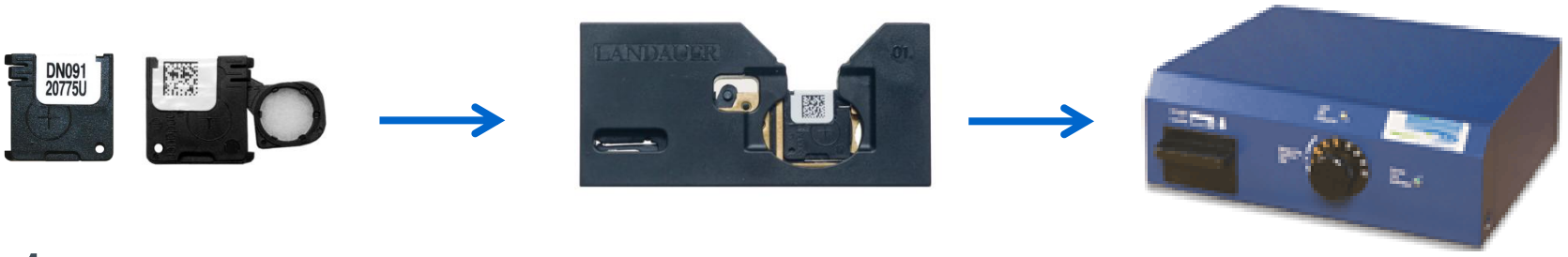
Dosimetric Performance of the nanoDot OSL Dosimeter

GENERAL PURPOSE (GP) VS. SCREENED NANODOTS

SENSITIVITY	GP nanoDots™	SCREENED nanoDots™
RANGE	0.75 – 1.10	0.75 – 1.10
ASSIGNMENT METHOD	*Population:* Manufacturer labels all nanoDots™ extruded from a roll of OSL material based on the LDR-supplied measured average sensitivity for that roll.	*Individual:* Single unlabeled GP nanoDot™ received from manufacturer undergoes sensitivity assignment and once labeled is retested to verify accuracy of labeled sensitivity
MEASURED BY	LDR QC Department (Roll)	LDR QC Department (nanoDot)
LABELED BY	GP nanoDot™ manufacturer	LDR QC Department

microStar Reader QA Program

Factors Impacting nanoDot™ Dose Accuracy



1. Accuracy of nanoDot™ labeled sensitivity
2. nanoDot™ physical/mechanical integrity
3. nanoDot™ adapter integrity
4. Reader LED/PMT & general electronic stability over time
5. Accuracy of reference calibration doses & resulting calibration factors
6. Number of single nanoDot™ readings obtained/averaged for reading
7. Use of multiple nanoDots™ for one measurement condition

Recommended Analytical Measurement Procedures (RAMPs)

- Use a common nanoDot adapter for both calibration, calibration verification and all subsequent readings and SCREENED nanoDots™
- Use calibration nanoDots irradiated to a KNOWN prescribed dose (ideally NIST-traceable) using a clinical radiation beam spectra and phantom geometry that emulates that of intended application (e.g. d_{max}, etc..)
- Read nanoDot(s) four (4) times; reject outlier if necessary
- Read nanoDots between 10 minutes and 360 minutes post irradiation
- Implement Landauer-recommended MicroStar QA Program

Dosimetric Performance of the nanoDot OSL Dosimeter

NANODOT PERFORMANCE

SPECIFIED	ACCURACY	PRECISION
GP nanoDots™	± 10%	± 5%
SCREENED nanoDots™	**± 5%**	**± 5%**

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NOTE:

Specifications above reflect expected DOSIMETRY performance when Recommended Analytical Measurement Procedures (RAMPs) are followed. (k=2; 95% confidence)

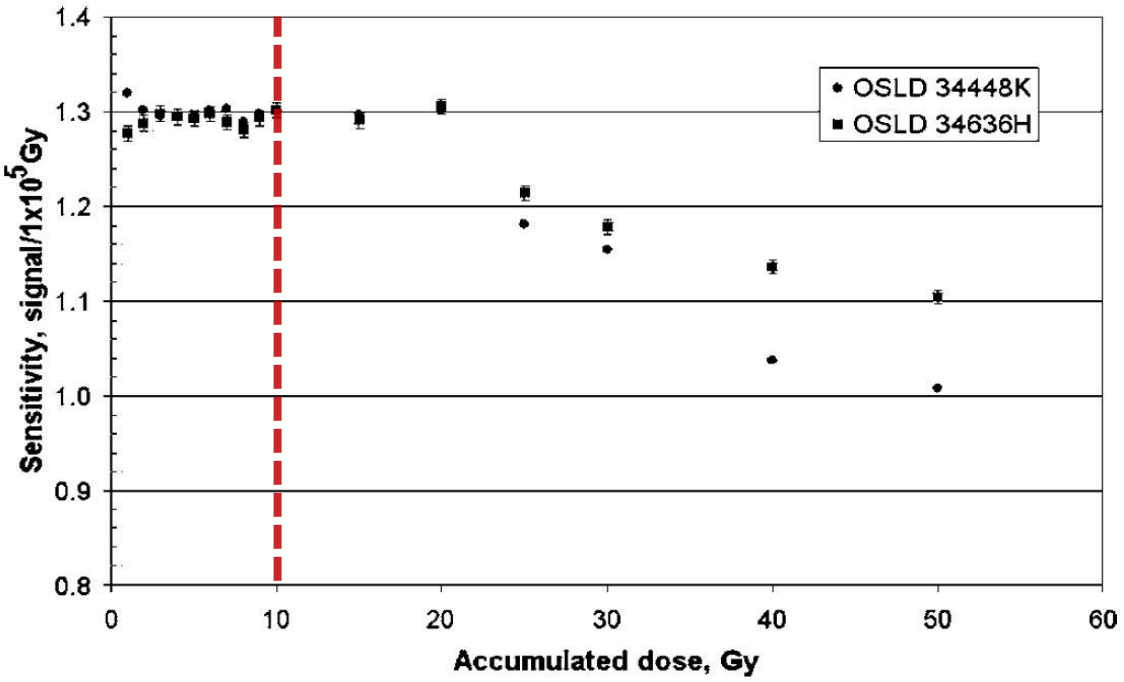
Dosimetric Performance of the nanoDot OSL Dosimeter

WARNING !

- Exposure to visible light will reduce the measured signal of unprotected aluminium oxide. Care must be taken to ensure the dosimeter is not mishandled or inadvertently opened after radiation exposure prior to readout.
- If dosimeters are not read immediately care should be taken to ensure they are not subject to extreme environmental conditions during transport or storage.
- Ultraviolet light will induce measurable signal for unprotected aluminium oxide. Take precautions to avoid subjecting unexposed dosimeters to unfiltered UV light sources either during storage or when performing an optical anneal operation.

Dosimetric Performance of the nanoDot OSL Dosimeter

NANODOT SENSITIVITY & ACCUMULATED DOSE

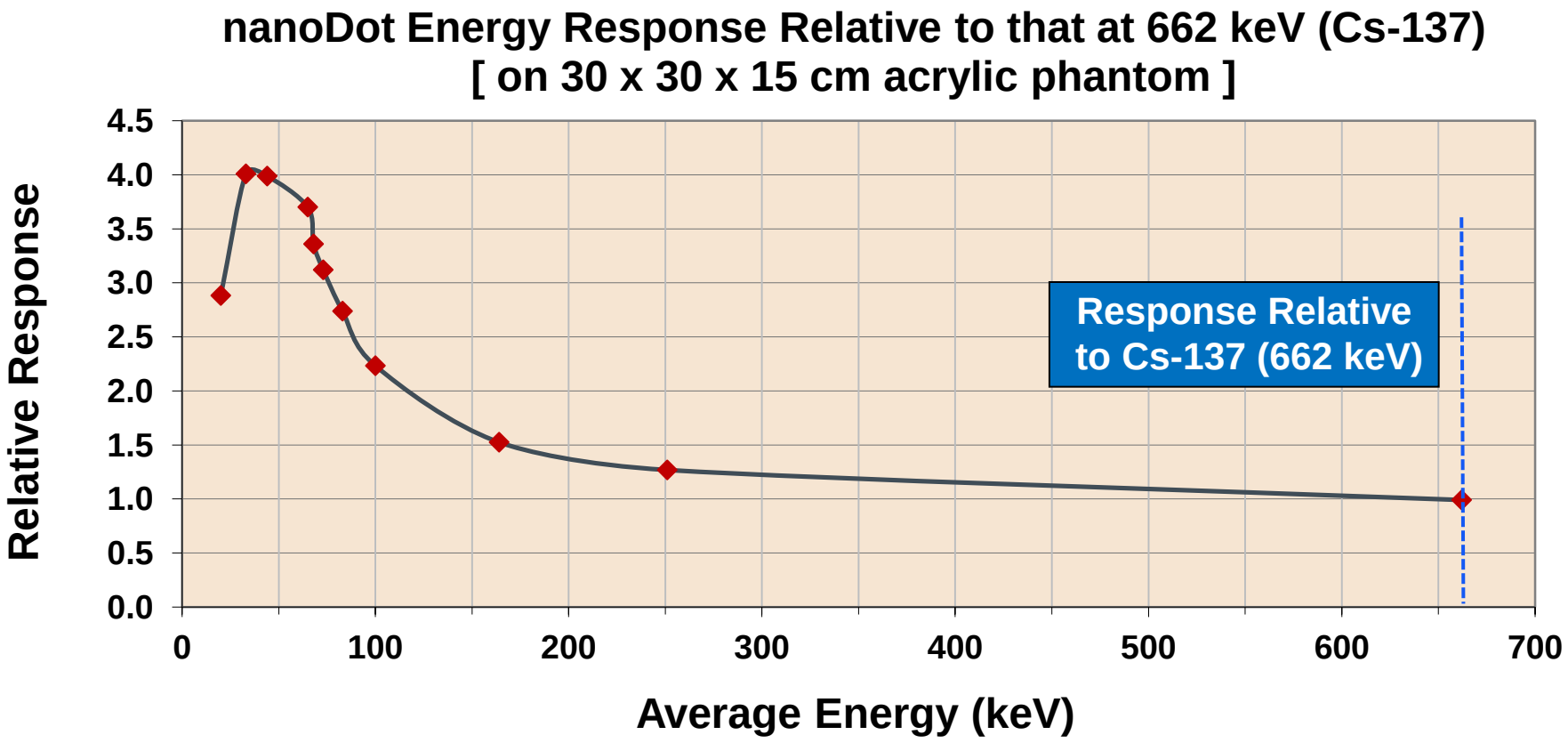


Best Practice: Remove nanoDots from service when lifetime dose > 10 Gy

P. Jursinic, Med Phys 34(12), 4594-4604.

Dosimetric Performance of the nanoDot OSL Dosimeter

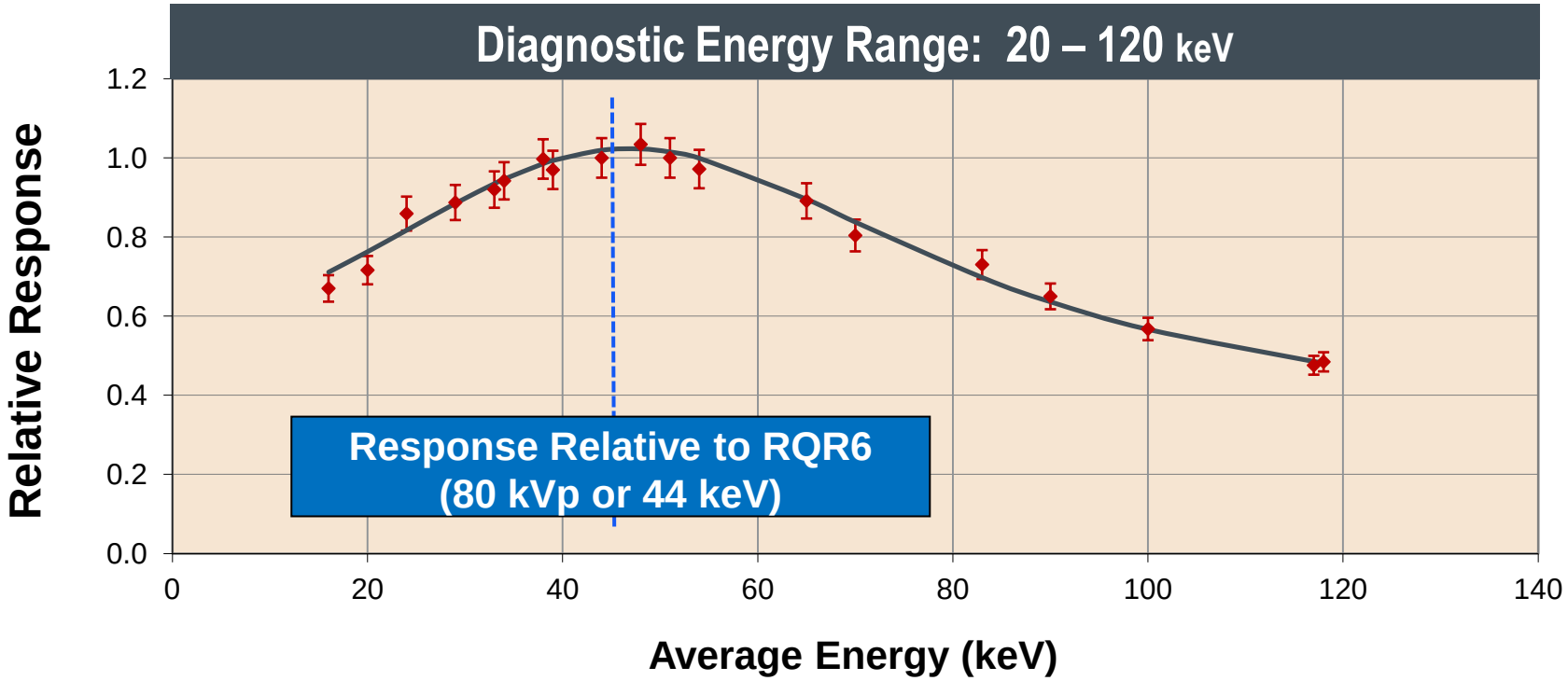
RELATIVE RESPONSE WITH PHOTON ENERGY



Dosimetric Performance of the nanoDot OSL Dosimeter

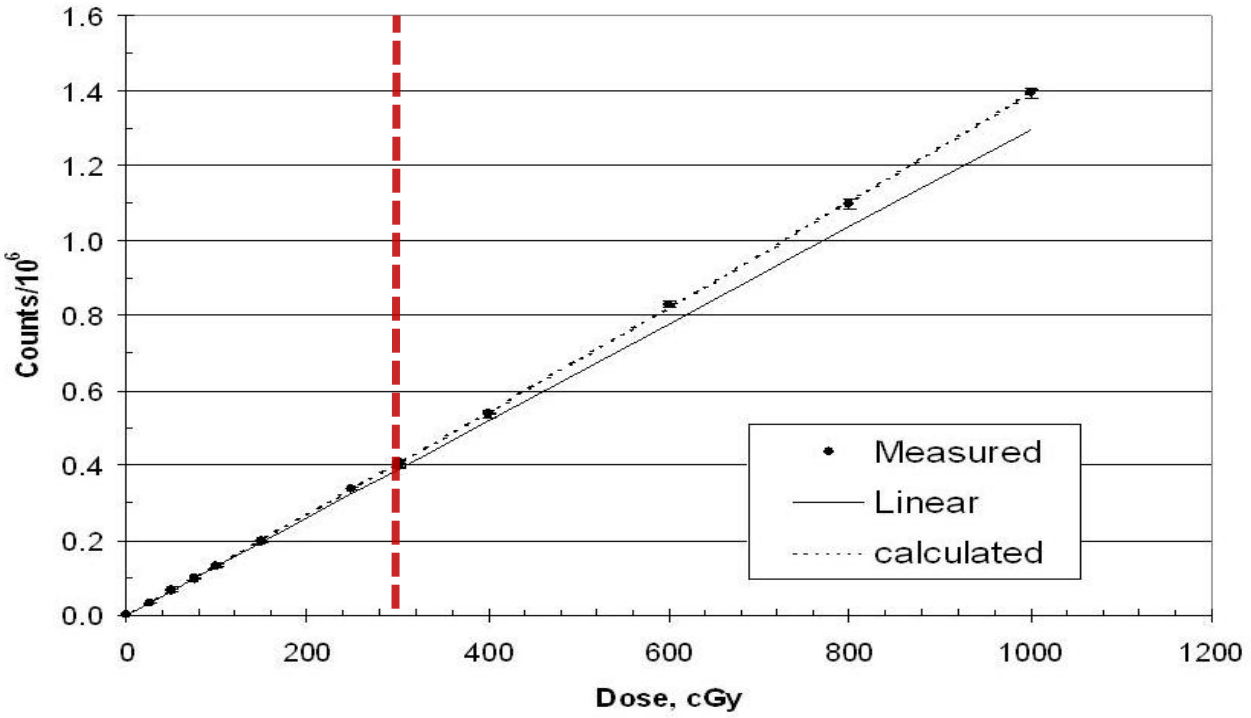
RELATIVE RESPONSE WITH PHOTON ENERGY

nanoDot Energy Response Relative to that at 80 kVp (44 keV)
[on 30 x 30 x 15 cm acrylic phantom]



Dosimetric Performance of the nanoDot OSL Dosimeter

LINEARITY OF RESPONSE WITH DOSE AT 6 MV



For most radiation therapy applications response is linear < 200-300 cGy

P. Jursinic, Med Phys 34(12), 4594-4604.

Characteristics of the MicroStar Reader

For doses > 300 cGy, a best fit to the average sensitivity- and background-corrected PMT counts versus dose can be established using a 2nd order polynomial fit yielding the calibration coefficients (CALFACTORS) a, b, & c in a quadratic expression having the form:

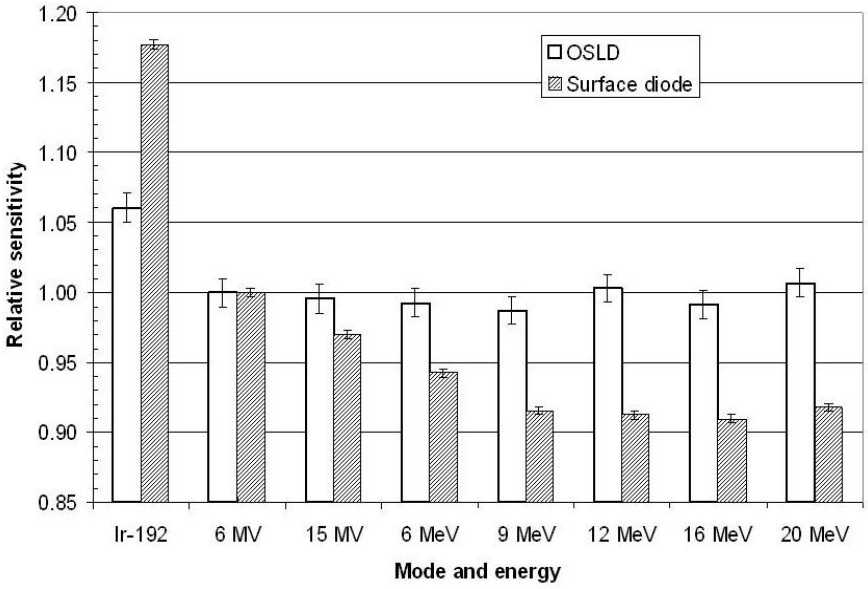
$$\text{Dose (cGy)} = aX^2 + bX + c$$

where X = the average sensitivity- and background-corrected raw PMT counts at a given dose level.

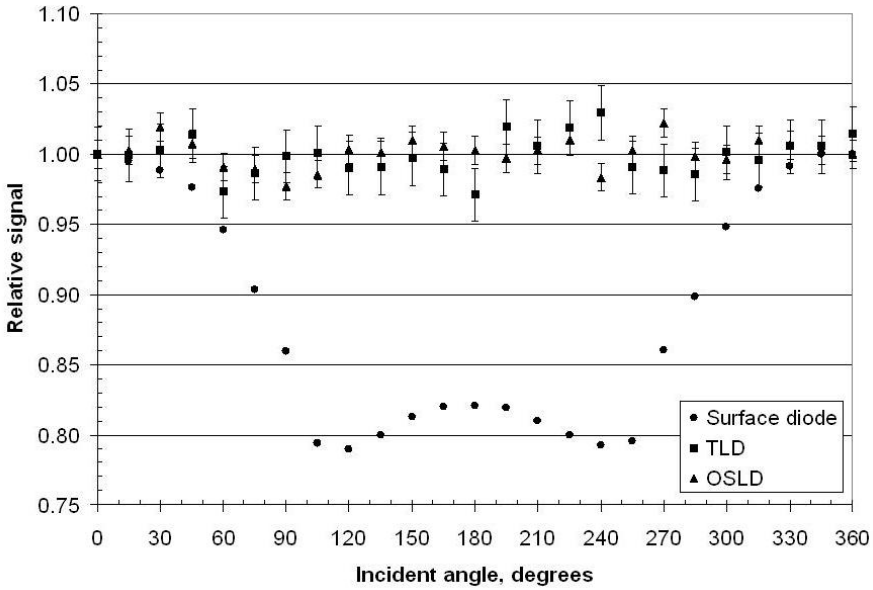
Units for a, b & c when dose units are “cGy” are: cGy/counts^2 (a), cGy/counts (b), & cGy (c), respectively

Characteristics of the MicroStar Reader

Therapeutic Energy Range: 6 MV - 18 MV; 6 MeV - 20 MeV



Minimal Energy Dependence

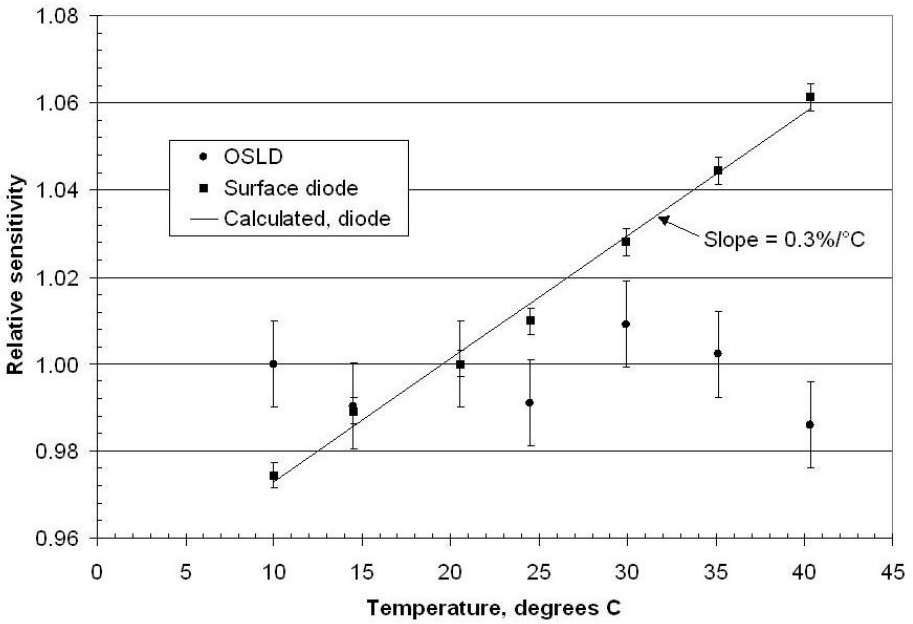


Minimal Angular Dependence

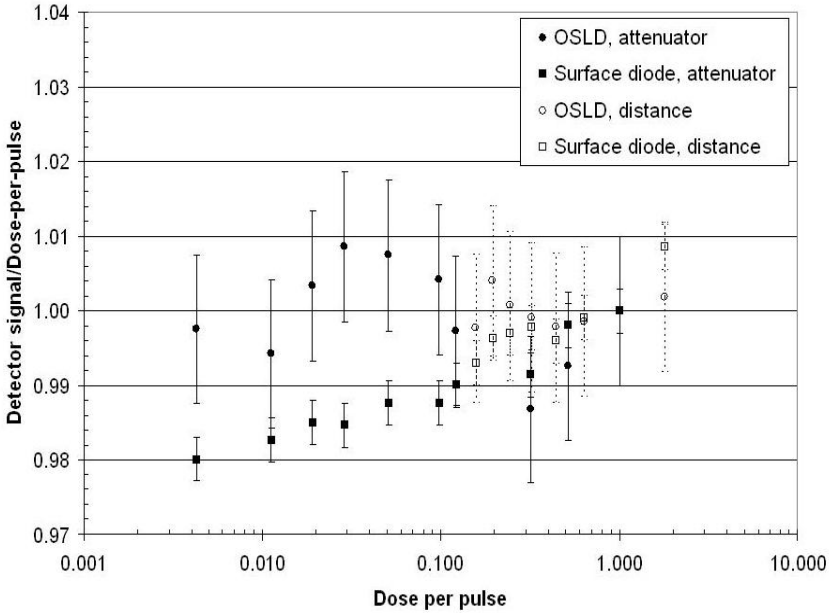
P. Jursinic, Med Phys 34(12), 4594-4604.

Characteristics of the MicroStar Reader

Therapeutic Energy Range: 6 MV - 18 MV; 6 MeV - 20 MeV



Minimal Temperature Dependence



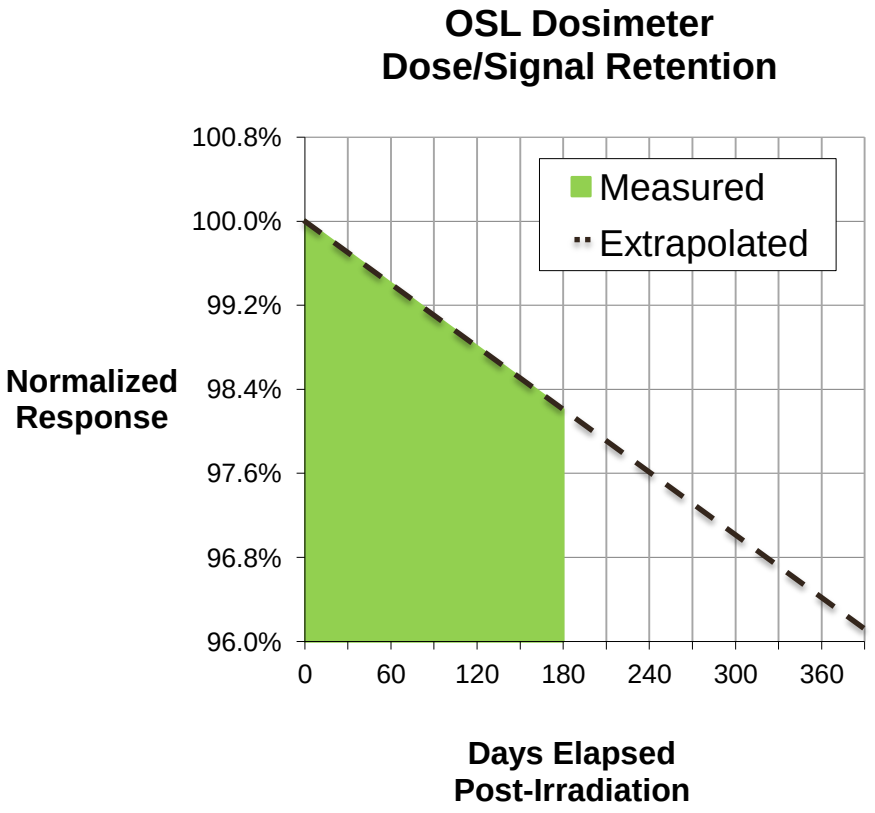
Minimal Dose-Rate Dependence

P. Jursinic, Med Phys 34(12), 4594-4604.

Dosimetric Performance of the nanoDot OSL Dosimeter

SIGNAL RETENTION / FADING

Under normal handling and environmental conditions the signal loss due to spontaneous depopulation of traps is expected to be less than 2% over 6 months, or no more than 4% signal fade over 12 months based on extrapolation of the observed rate of fading.



Dosimetric Performance of the nanoDot OSL Dosimeter

SIGNAL DEPLETION DUE TO READOUT

Using an optical stimulation of 1.0 sec. duration (reader default), *typical* depletion rates per individual reading are:

0.05 % High Doses (Weak Beam) > Cross-Over-Point (> ~ 15 cGy)

0.5% Low Doses (Strong Beam) < Cross-Over-Point (< ~ 15 cGy)

IMPORTANT: Cross-Over-Point can now be changed by customer in v4.3 and radiation therapy customers can now force a low illumination readout mode (0.05% depletion per reading) for all readings regardless of dose.

MICROSTAR READER QA PROGRAM

MEDICAL DOSIMETRY USERS

MOTIVATION

Quality Assurance is a Process

and needs to be addressed at each

stage of implementation

microStar Reader QA Program

Emulates Medical Device "Best Practices"

I. Manufacturer In-house QC Tests

II. On-site Clinical Installation/Acceptance Tests

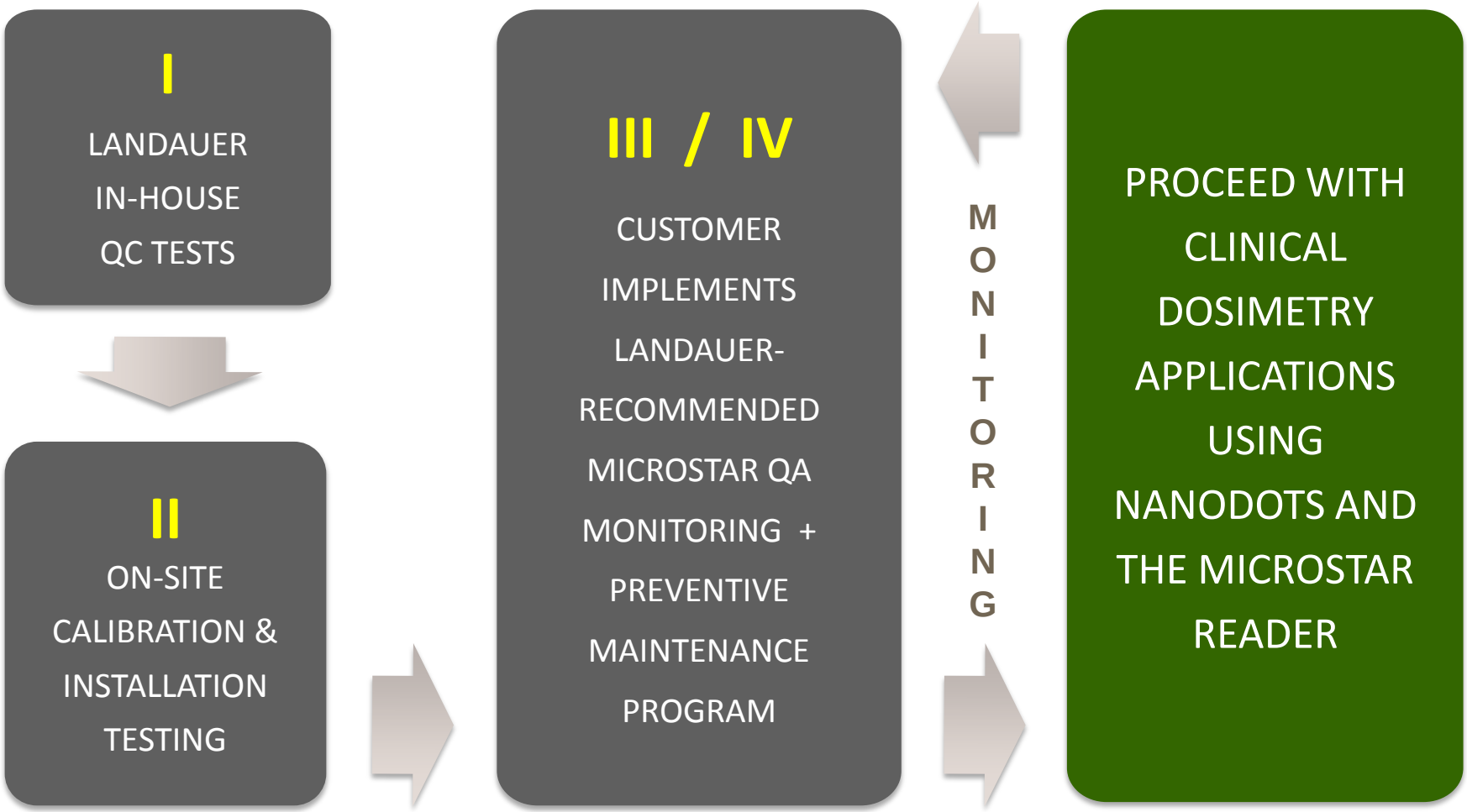
III. On-going DAILY/MONTHLY/ANNUAL Performance Testing / Monitoring

IV. Periodic Preventive Maintenance including: Cleaning, Re-Calibration &/or Repair (as indicated)

LANDAUER®

microStar Reader QA Program

Requirement for Continuous Performance Monitoring



Control Limits

The MicroStar QA Program for Medical Dosimetry Users now utilizes Control Limits for all specified tests in order to establish clear criteria for determining whether the reader is performing at acceptable levels for this application.

LANDAUER

microStar Reader QA Program

Mandatory Performance Thresholds

I

LANDAUER IN-HOUSE QC TESTS

II

ON-SITE CALIBRATION & INSTALLATION TESTING

III / IV

CUSTOMER IMPLEMENTS LANDAUER-RECOMMENDED MICROSTAR QA MONITORING + PREVENTIVE MAINTENANCE PROGRAM

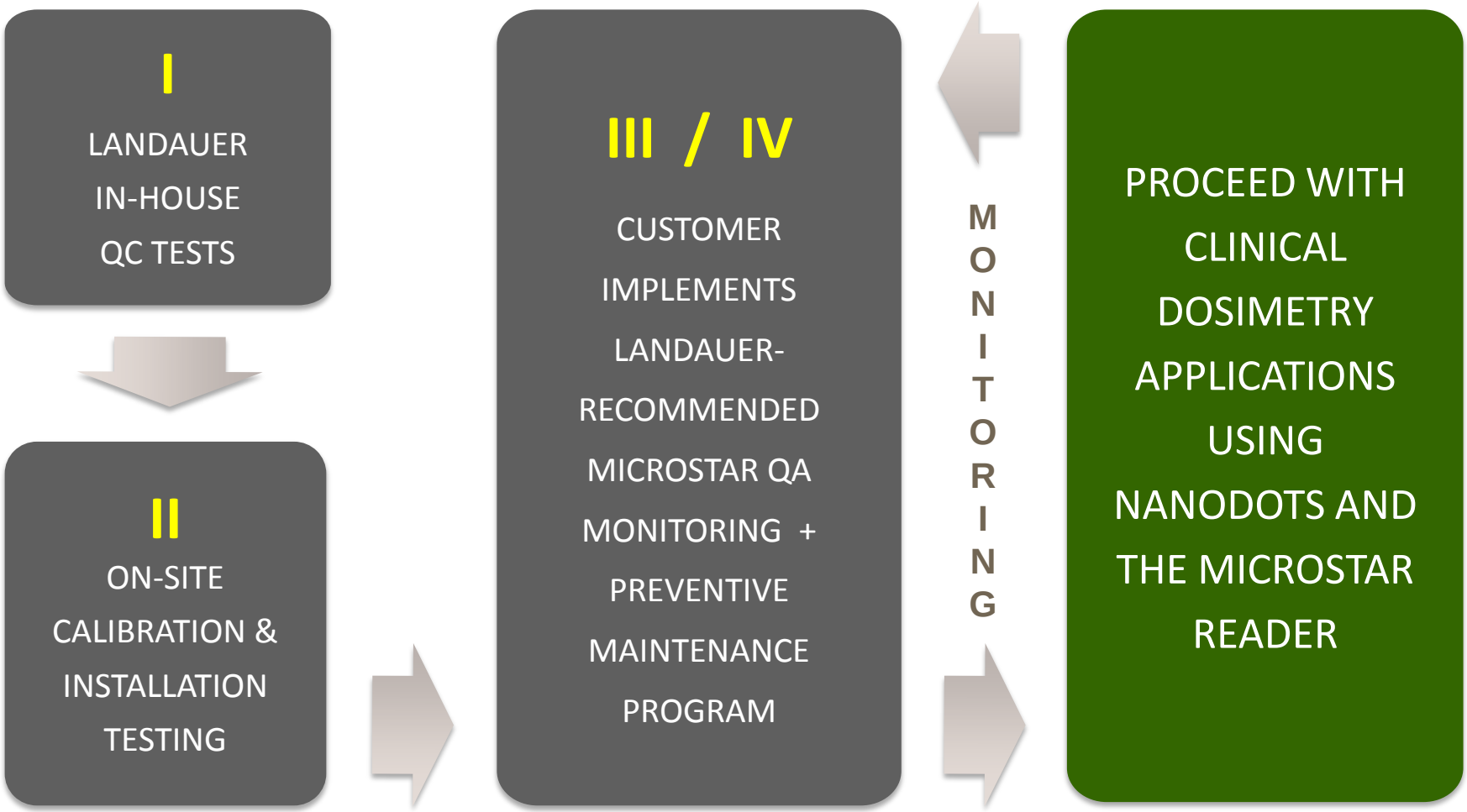
MONITORING

DISCONTINUE USE IF MICROSTAR READER DOES NOT MEET MANDATORY PERFORMANCE THRESHOLDS

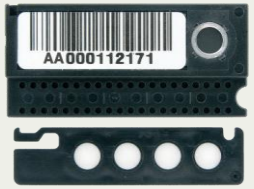
LANDAUER®

microStar Reader QA Program

Requirement for Continuous Performance Monitoring



In-Light Dosimeters



① Establish Cross-Over Point (COP)
② MicroStar Calibration
③ Linearity of Response with Dose Level
④ Reading Reproducibility
⑤ Lowest Level of Detection (LLD)
⑥ Reading Depletion Rate: Strong & Weak Beam Mode

Intrinsic (No Dosimeter Required)

⑦ **Standard Measurements**
(Electronics, PMT & LED Stability)

⑧ **Light Leakage (Physical integrity of reader housing)**

nanoDot Dosimeters

⑨ **Cross-Over Point (COP) (PENDING)**

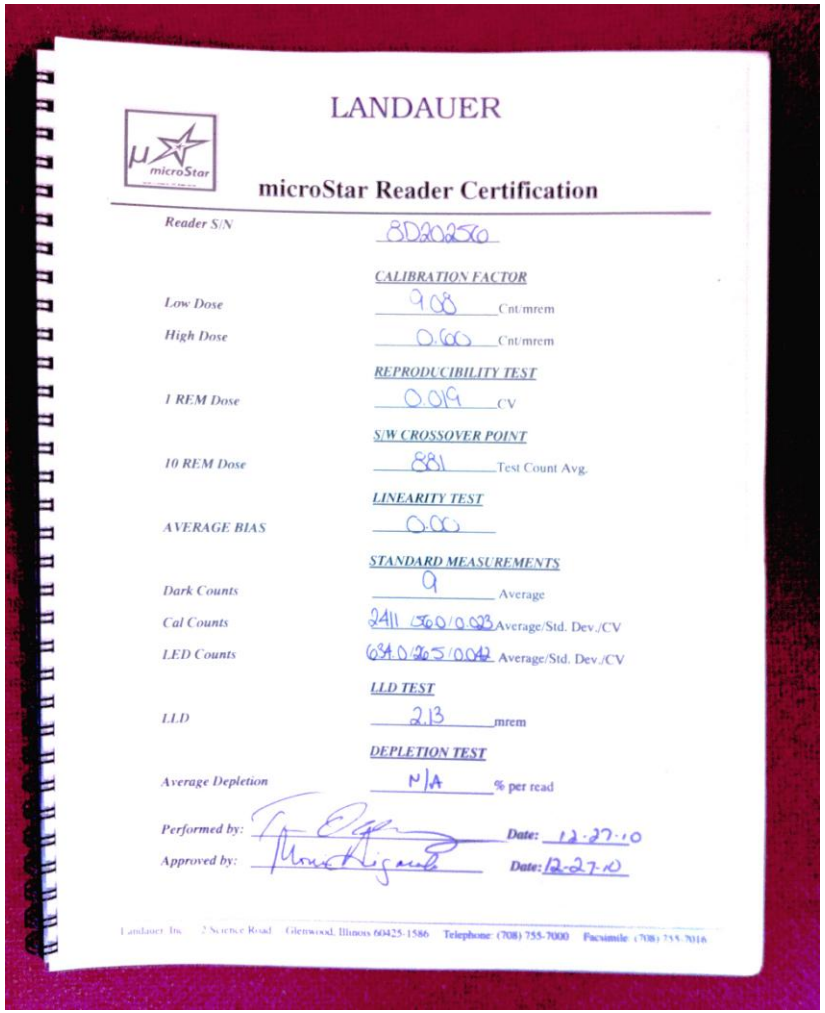
⑩ **NanoDot Reading Reproducibility:**

- **5 nanoDots, new adapter/key plate, 2 new adapters**

EACH MICROSTAR READER MUST PASS ALL MANUFACTURING TESTS IN ORDER TO BE SHIPPED

microStar Reader QA Program

Manufacturing Test Summary Report Sheet



LANDAUER

microStar Reader Certification

Reader S/N 8D202500

CALIBRATION FACTOR

Low Dose 9.08 Cnt/mrem

High Dose 0.600 Cnt/mrem

REPRODUCIBILITY TEST

1 REM Dose 0.019 CV

S/W CROSSOVER POINT

10 REM Dose 881 Test Count Avg.

LINEARITY TEST

AVERAGE BIAS 0.00

STANDARD MEASUREMENTS

Dark Counts 9 Average

Cal Counts 2411 / 360 / 0.023 Average/Std. Dev./CV

LED Counts 634 0 / 265 / 0.042 Average/Std. Dev./CV

LLD TEST

LLD 2.13 mrem

DEPLETION TEST

Average Depletion N/A % per read

Performed by: Date: 12-27-10

Approved by: Date: 12-27-10

Landauer Inc. 2 Science Road Glenwood, Illinois 60425-1586 Telephone: (708) 755-7000 Facsimile: (708) 755-7016

Reader Serial #

Test Date

Calibration Factors at 662 keV:

- **Low Dose Range**
- **High Dose Range**

Factory-Established Cross-Over Point

Standard Measurements:

- **DRK (Max)**
- **CAL (Avg./CV)**
- **LED (Avg./CV)**

Lowest Level of Detection (LLD)

MicroStar™ Reader
DX & TX Users

① Unit arrives on-site, is unpacked & setup
② Thermal stabilization (1-24 hours)
③ Electronic stabilization (at least 30 min.)
④ Reader stability: 20 cycles of standard measurements
⑤ nanoDot reading reproducibility with each adapter
⑥ Calibration using 80 kVp (DX, TX users optional)
⑦ Accuracy in dose readings (post-calibration QC test)

MicroStar™ Reader
TX Users only

⑧ Clinical Beam Calibration + Verification

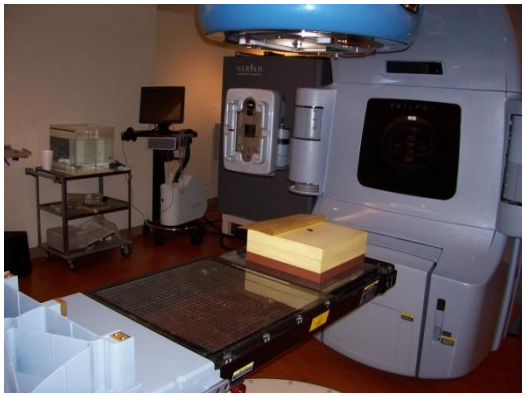
- Application-specific calibration & post-calibration verification using clinical beam spectra when prescribed dose is known to reasonable accuracy, i.e. in radiation therapy

- RESOURCE: White Paper - *"Calibrating the microStar"*

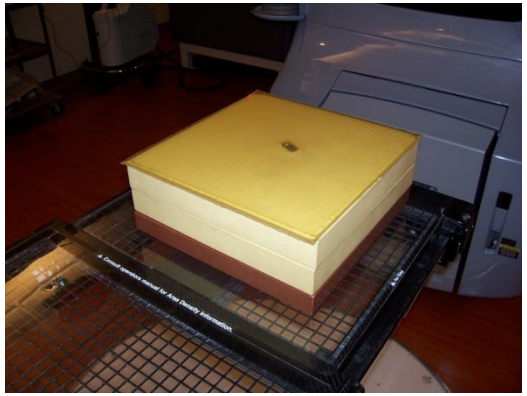
microStar Reader QA Program

Geometry for Standard Therapy Calibration

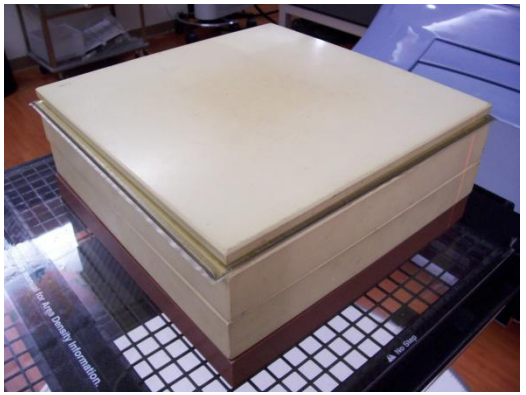
Exposure geometry must be consistent with that recommended by Landauer in the microStar white paper: "Calibrating the microStar Reader"



10+ cm thick solid water Phantom centered on beam axis such that surface is at an SSD of 100 cm
.

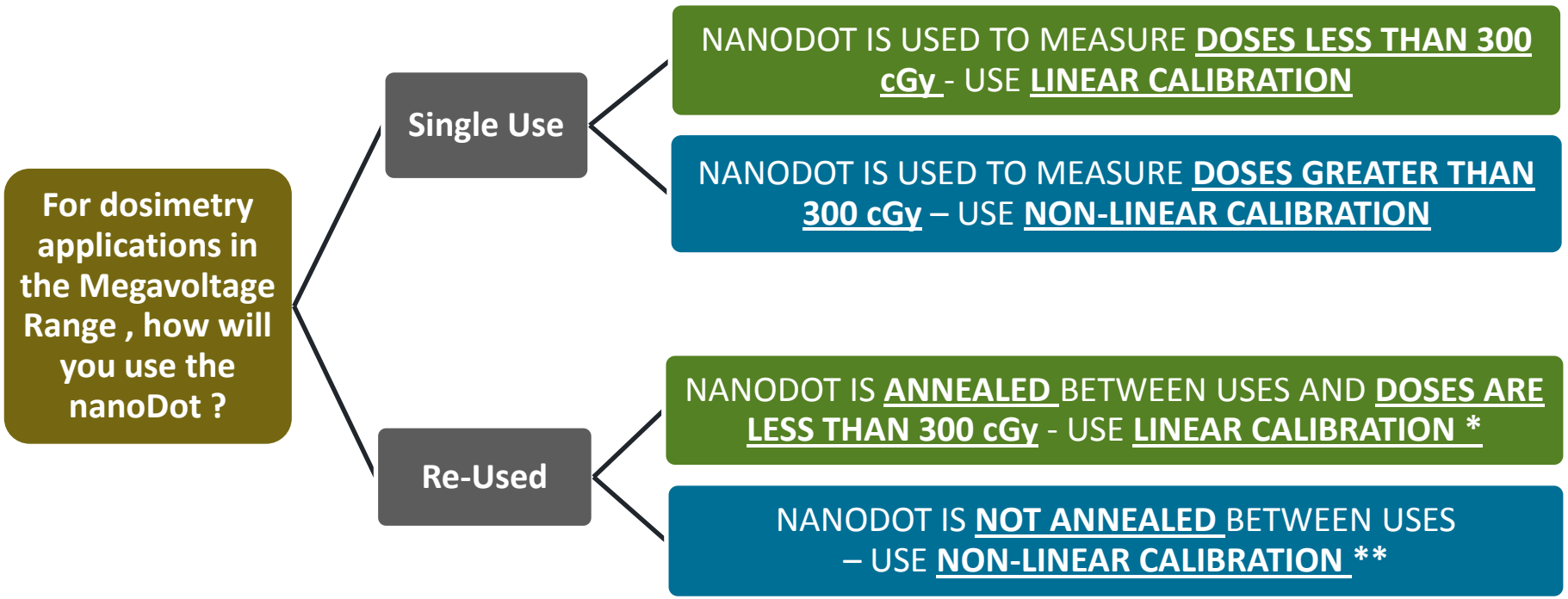


3-4 unexposed screened nanoDots are positioned at beam center on flexible solid water slab



Additional thicknesses of solid water added to achieve a total overlying thickness of $d_{max.}$ Typically 6 MeV photon beam is used (d_{max}=1.5 cm).

Therapy Calibration Protocols: How to Choose ?



* nanoDot cummulative dose must be monitored to ensure lifetime dose does not exceed 10 Gy.

** This mode is not generally recommended because of the increasing variance in successive readings as predicted by the rules for error propagation: When using mathematical expressions to compute a result, the result will always have a variance greater than the largest variance in the individual variables used in the expression calculation.

Therapy Megavoltage Calset created by customer

Recommended Default Dose Levels

Linear Calibration (use for Doses < 300 cGy):

Low Dose Range (<15 cGy): unexposed, 5 cGy, 10 cGy
High Dose Range (> 15 cGy): 50, 100, 200, (300 optional) cGy

NOTE: If the COP is lowered such that a 10 cGy dose falls in the HIGH DOSE range, a separate low dose calibration is not required: Add unexposed ,5 cGy, and 10 cGy dose levels to high dose levels.

Non-Linear Calibration (use for Doses > 300 cGy):

High Dose Range: 50, 100, 300, 500, 800, 1000, 1300 cGy

These default dose levels are provided for instructional purposes.
It is the user's responsibility to select a dose calibration protocol that is most appropriate for their clinical application.
Contact Landauer Customer Service for additional guidance.

Guidelines when using Calibration/QC nanoDots

For microStar calibrations performed using a Landauer-supplied CALSET, dose level must be obtained from the Calibration Certificate.

Calibration & QC (Calibration verification) nanoDots are not to be used for other purposes to avoid inaccurate calibration due to depletion effects.

Frequency of use of CAL/QC nanoDots needs to be tracked to avoid excessive depletion which can impact accuracy.

Calsets will have a finite lifetime before they should be retired – recommended lifetime for Calsets used in medical dosimetry is no longer than SIX MONTHS. Calsets reused often may need to be replaced sooner.

microStar Reader QA Program

Guidelines for Calibration Frequency

MINIMUM

- At installation
- After repair / service
- Whenever QC/Accuracy Test Fails

IDEALLY*

- On a regular/proactive schedule

ROUTINE
QUALITY CONTROL

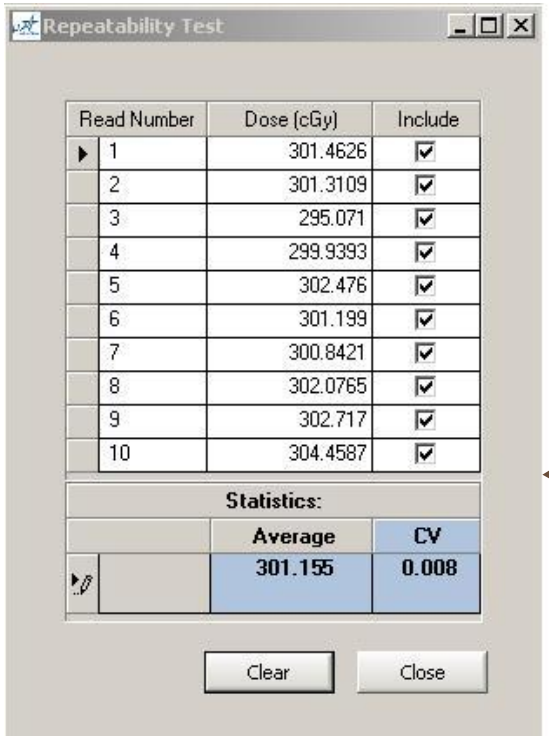
MicroStar™ Reader Daily QC Tests
DX & TX Users

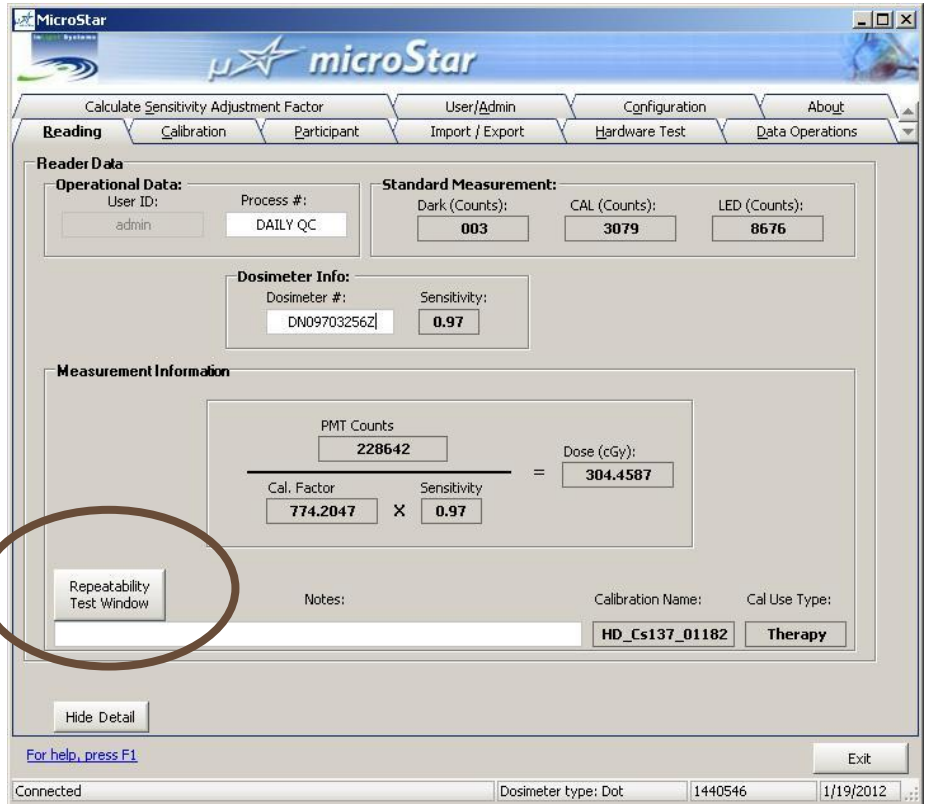
① Warm-up (at least 30 min.)
② 5 Cycles of Standard Measurements
③ nanoDot reading reproducibility (10 sequential readings)
④ Constancy nanoDot reading (OPTIONAL)

Aside from the warmup period, the actual test protocol takes less than 5 minutes to complete.

Daily QC Tests

NANODOT READING REPRODUCIBILITY TEST SUPPORTED in v4.3 SOFTWARE USING "REPEATABILITY TEST WINDOW"



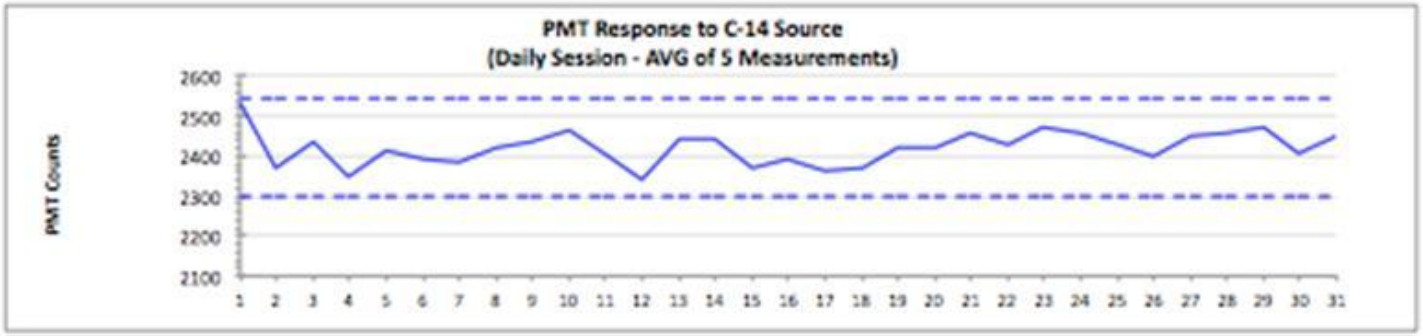


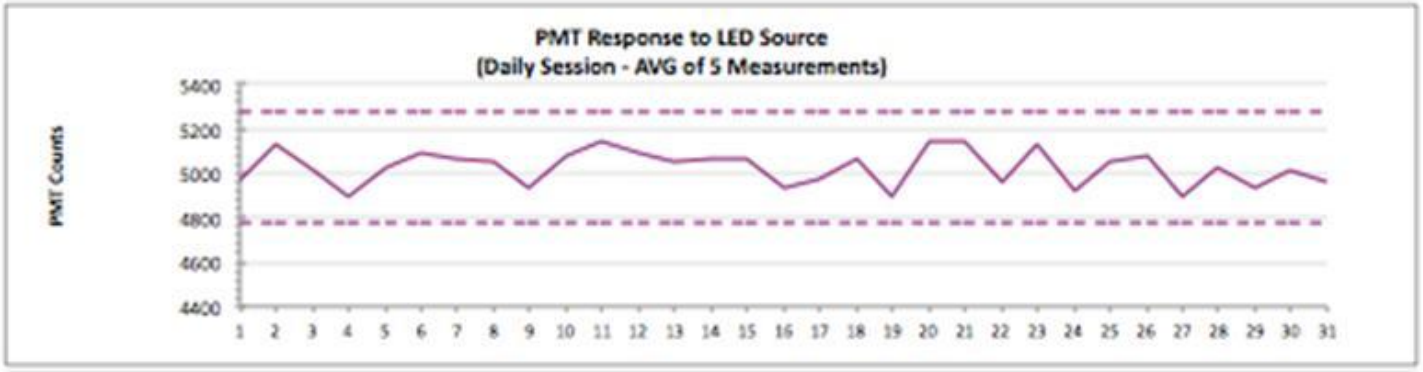
Monitoring Reader Performance Trends

PERFORMANCE METRICS THAT SHOULD BE MONITORED OVER TIME FOR TRENDS

1. STANDARD MEASUREMENT RESULTS (DAILY & OTHER)
2. DAILY CONSTANCY NANODOT (OPTIONAL)
3. CALIBRATION FACTORS BY ENERGY, DOSE RANGE

Example: Monitoring Trends in Daily QC Readings





RESOURCES

RESOURCES: Landauer MicroSite (WIP – See Updates)

- Electronic version of Manuals & Procedure Flow Charts
- QC Forms
- QC Report Spreadsheets
- Viewable “Click Through” Educational Presentations
- “How to” Instructional Videos
- Technical White Papers
- Clinical Application Guides
- Self-study resource list: peer-reviewed publications & books
- MicroStar Training Certification via Post-Training Self-Test
- FAQ & Trouble-shooting Guidelines

RESOURCE: Installation Testing Flow Charts

MicroStar Reader Testing at Installation (Page 1 of 2)

(Recommended for Medical Dosimetry Users: DX & TX)

Turn on the MicroStar® Reader and allow it to warm up for at least 30 minutes prior to use. Turn on the computer and launch the MicroStar® reader Application.

Verify basic reader function by acquiring a series of **TWENTY (20) repeat STANDARD MEASUREMENTS** (DRK, PMT, CAL). (Consult the User Manual for detailed procedure.)
MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: DRK $_{1\text{-}5}$ <20, CV $_{5\ CAL}$ < 0.05, CV $_{5\ LED}$ <0.05; COMPARE WITH FACTORY-ESTABLISHED BASELINE VALUES, RE-ESTABLISH NEW BASELINE IF NECESSARY. DAY-TO-DAY VARIATION IN AVERAGES SHOULD BE WITHIN ±5% OF BASELINE CONTROL LIMITS.

Identify the nanoDot™ adapter to be used routinely and perform a **nanoDot™ READING REPRODUCIBILITY TEST** by reading a "high dose" nanoDot™ ten times. (Consult the User Manual for detailed procedure.)
MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: $CV_{10\ Readings}$<0.01

To calibrate the reader, perform a **LINEAR CALIBRATION** for both the *LOW DOSE* and *HIGH DOSE* operating ranges using the Landauer-supplied *CALIBRATION (Calset) nanoDots™* which have been exposed to a calibrated radiation spectrum appropriate for your application (Dx: 80 kVp x-ray beam ; Tx: 662 keV Cs-137 source) (Consult the User Manual for detailed procedure.) ***MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: CV<0.05 FOR EACH SET OF READINGS AT EACH CALIBRATION DOSE LEVEL.***

Perform a **POST-CALIBRATION QC CHECK** to ensure the calibration is acceptable using Landauer-supplied *CALTEST (QC) nanoDots™ included with the Calibration Calset*. (Consult the User Manual for detailed procedure.)
MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: CV<0.05 FOR EACH SET OF READINGS AT EACH DOSE LEVEL AND AVERAGE DOSE READING SHOULD BE WITHIN ±5% OF THE QC NANODOT™ KNOWN DOSE.

LAUNCH MICROSTAR READER QUALITY ASSURANCE PROGRAM BY IMPLEMENTING PERIODIC QUALITY CONTROL TESTS

IF YOU HAVE QUESTIONS, CONCERNS, OR FAILED TEST RESULTS CONTACT LANDAUER CUSTOMER SERVICE AT:

1 - 800 - 323 - 8830

LANDAUER®

LDR-PROCESS-2012-001A

MicroStar Reader Testing at Installation (Page 2 of 2)

CLINICAL HIGH ENERGY BEAM SPECTRUM CALIBRATION

(Recommended for Medical Dosimetry Users: TX only)

Turn on the MicroStar® Reader and allow it to warm up for at least 30 minutes prior to use. Turn on the computer and launch the MicroStar® reader Application.

Conduct MicroStar® **DAILY QUALITY CONTROL** tests to verify reader performance. (Consult the MicroStar® Reader Daily Quality Control Tests section of the User Manual.)

Using the clinical beam spectrum of interest and recommended geometry (i.e. 6MV high energy photon beam and nanoDots™ positioned on the beam axis and at a depth of dmax within a solid water phantom) **IRRADIATE the nanoDots™** (3 per required dose level) to generate a calibration and post-calibration QC test set. **CALIBRATE the MicroStar® READER** using the recommended protocol. *(Calibration dose ranges, levels and mode (linear vs. non-linear) will be dictated by the clinical application. Consult the MicroStar® User Manual for the recommended default clinical calibration protocol for new MicroStar® users.)* ***General Note: Always read nanoDots 4 times to achieve reliable results.*** Perform a **POST-CALIBRATION QC CHECK** to verify the Calibration and that the Calibration Factors are loading correctly. (Consult the User Manual for additional details as necessary.)
MANDATORY CALIBRATION AND POST CALIBRATION QC VERIFICATION PASS CRITERIA FOR QA DOSIMETRY (USING SCREENED NANODOTS AND AVERAGE OF 4 READINGS): CV<0.05 FOR EACH SET OF READINGS AT EACH DOSE LEVEL AND AVERAGE DOSE READING OBTAINED WITH THE QC NANODOTS SHOULD BE WITHIN ±5% OF THE KNOWN DOSE.

LAUNCH PATIENT DOSIMETRY SECONDARY VERIFICATION PROGRAM

IF YOU HAVE QUESTIONS, CONCERNS, OR FAILED TEST RESULTS CONTACT LANDAUER CUSTOMER SERVICE AT:

1 - 800 - 323 - 8830

LANDAUER®

LDR-PROCESS-2012-001B

MicroStar Reader Testing at Installation (Page 1 of 2)

(Recommended for Medical Dosimetry Users: DX & TX)

Turn on the MicroStar® Reader and allow it to warm up for at least 30 minutes prior to use. Turn on the computer and launch the MicroStar® reader Application.

Verify basic reader function by acquiring a series of **TWENTY (20) repeat STANDARD MEASUREMENTS** (DRK, PMT, CAL). (Consult the User Manual for detailed procedure.)
MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: DRK $_{1\text{-}5}$ <20, CV $_{5\ CAL}$ < 0.05, CV $_{5\ LED}$ <0.05; COMPARE WITH FACTORY-ESTABLISHED BASELINE VALUES, RE-ESTABLISH NEW BASELINE IF NECESSARY. DAY-TO-DAY VARIATION IN AVERAGES SHOULD BE WITHIN ±5% OF BASELINE CONTROL LIMITS.

Identify the nanoDot™ adapter to be used routinely and perform a **nanoDot™ READING REPRODUCIBILITY TEST** by reading a "high dose" nanoDot™ ten times. (Consult the User Manual for detailed procedure.)
MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: $CV_{10\ Readings}$<0.01

To calibrate the reader, perform a **LINEAR CALIBRATION** for both the *LOW DOSE* and *HIGH DOSE* operating ranges using the Landauer-supplied *CALIBRATION (Calset) nanoDots™* which have been exposed to a calibrated radiation spectrum appropriate for your application (Dx: 80 kVp x-ray beam ; Tx: 662 keV Cs-137 source) (Consult the User Manual for detailed procedure.) *MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: CV<0.05 FOR EACH SET OF READINGS AT EACH CALIBRATION DOSE LEVEL.*

Perform a **POST-CALIBRATION QC CHECK** to ensure the calibration is acceptable using Landauer-supplied *CALTEST (QC) nanoDots™ included with the Calibration Calset*. (Consult the User Manual for detailed procedure.)
MANDATORY TEST PASS CRITERIA FOR QA DOSIMETRY: CV<0.05 FOR EACH SET OF READINGS AT EACH DOSE LEVEL AND AVERAGE DOSE READING SHOULD BE WITHIN ±5% OF THE QC NANODOT™ KNOWN DOSE.

LAUNCH MICROSTAR READER QUALITY ASSURANCE PROGRAM BY IMPLEMENTING PERIODIC QUALITY CONTROL TESTS

IF YOU HAVE QUESTIONS, CONCERNS, OR FAILED TEST RESULTS CONTACT LANDAUER CUSTOMER SERVICE AT:

1 - 800 - 323 - 8830

LANDAUER®

LDR-PROCESS-2012-001A

MicroStar Reader Testing at Installation (Page 2 of 2)

CLINICAL HIGH ENERGY BEAM SPECTRUM CALIBRATION

(Recommended for Medical Dosimetry Users: TX only)

Turn on the MicroStar® Reader and allow it to warm up for at least 30 minutes prior to use. Turn on the computer and launch the MicroStar® reader Application.

↓

Conduct MicroStar® **DAILY QUALITY CONTROL** tests to verify reader performance. (Consult the MicroStar® Reader Daily Quality Control Tests section of the User Manual.)

↓

Using the clinical beam spectrum of interest and recommended geometry (i.e. 6MV high energy photon beam and nanoDots™ positioned on the beam axis and at a depth of dmax within a solid water phantom) **IRRADIATE the nanoDots™** (3 per required dose level) to generate a calibration and post-calibration QC test set. **CALIBRATE the MicroStar® READER** using the recommended protocol. *(Calibration dose ranges, levels and mode (linear vs. non-linear) will be dictated by the clinical application. Consult the MicroStar® User Manual for the recommended default clinical calibration protocol for new MicroStar® users.)* *General Note: Always read nanoDots 4 times to achieve reliable results.* Perform a **POST-CALIBRATION QC CHECK** to verify the Calibration and that the Calibration Factors are loading correctly. (Consult the User Manual for additional details as necessary.)

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↓

LAUNCH PATIENT DOSIMETRY SECONDARY VERIFICATION PROGRAM

IF YOU HAVE QUESTIONS, CONCERNS, OR FAILED TEST RESULTS CONTACT LANDAUER CUSTOMER SERVICE AT:

1 - 800 - 323 - 8830

LANDAUER®

LDR-PROCESS-2012-001B

RESOURCE: Standard Measurements Work Sheet

MicroStar® Reader Standard Measurement Control Limits

LANDAUER®

INSTITUTION: _____ READER SERIAL #: _____

INSTALLED LOCATION: _____ INSTALL DATE: _____

TEST DATE: _____

TWENTY CYCLES OF THE STANDARD MEASUREMENTS SEQUENCE (DRK / CAL / LED) SHOULD BE PERFORMED TO VERIFY READER PERFORMANCE AT INSTALLATION AND SHOULD BE REPEATED PERIODICALLY TO VERIFY COMPLIANCE WITH PREVIOUSLY ESTABLISHED CONTROL LIMITS OR TO ESTABLISH NEW CONTROL LIMITS. (READER WARMUP OF AT LEAST 30 MINUTES IS MANDATORY.)

#	DRK	CAL	LED
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
MINIMUM			
MAXIMUM			
AVERAGE			
STDEV			
CV			
CV < 5%			
LOWER: 0.95 x AVG			
UPPER: 1.05 x AVG			

PMT DARK COUNTS (DRK)

The MAXIMUM Dark Counts should be < 20.

(This is also the criteria for ACCEPTANCE for Daily QC)

PASS / FAIL

PMT RESPONSE TO C-14 SOURCE (CAL)

The CV should be < 5 %

(This is also part of the criteria for ACCEPTANCE for Daily QC)

NOTE: The AVG must be within +/- 5% of the previous result.

PASS / FAIL

PMT RESPONSE TO LED ARRAY (LED)

The CV should be < 5 %

(This is also part of the criteria for ACCEPTANCE for Daily QC)

NOTE: The AVG must be within +/- 5% of the previous result.

PASS / FAIL

CAL CONTROL LIMITS

LOWER (0.95 x CAL_AVG) _____

UPPER (1.05 x CAL_AVG) _____

LED CONTROL LIMITS

LOWER (0.95 x LED_AVG) _____

UPPER (1.05 x LED_AVG) _____

Record limits on the Standard Measurements Control Limits Log Sheet and on the DAILY QC Log Sheet

MicroStar® Reader Standard Measurement Control Limits

LANDAUER

INSTITUTION: _____ READER SERIAL #: _____

INSTALLED LOCATION: _____ INSTALL DATE: _____

TEST DATE: _____

TWENTY CYCLES OF THE STANDARD MEASUREMENTS SEQUENCE (DRK / CAL / LED) SHOULD BE PERFORMED TO VERIFY READER PERFORMANCE AT INSTALLATION AND SHOULD BE REPEATED PERIODICALLY TO VERIFY COMPLIANCE WITH PREVIOUSLY ESTABLISHED CONTROL LIMITS OR TO ESTABLISH NEW CONTROL LIMITS. (READER WARMUP OF AT LEAST 30 MINUTES IS MANDATORY.)

#	DRK	CAL	LED
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
MINIMUM			
MAXIMUM			
AVERAGE			
STDEV			
CV			
CV < 5%			
LOWER: 0.95 x AVG			
UPPER: 1.05 x AVG			

PMT DARK COUNTS (DRK)

The MAXIMUM Dark Counts should be < 20.

(This is also the criteria for ACCEPTANCE for Daily QC)

PASS / FAIL

PMT RESPONSE TO C-14 SOURCE (CAL)

The CV should be < 5 %

(This is also part of the criteria for ACCEPTANCE for Daily QC)

NOTE: The AVG must be within +/- 5% of the previous result.

PASS / FAIL

PMT RESPONSE TO LED ARRAY (LED)

The CV should be < 5 %

(This is also part of the criteria for ACCEPTANCE for Daily QC)

NOTE: The AVG must be within +/- 5% of the previous result.

PASS / FAIL

CAL CONTROL LIMITS

LOWER (0.95 x CAL_AVG)

UPPER (1.05 x CAL_AVG)

LED CONTROL LIMITS

LOWER (0.95 x LED_AVG)

UPPER (1.05 x LED_AVG)

Record limits on the Standard Measurements Control Limits Log Sheet and on the DAILY QC Log Sheet

RESOURCE: Standard Measurements Log Sheet

MicroStar® Reader Standard Measurements Control Limit / Testing Log

LANDAUER®

INSTITUTION: _____ READER SERIAL #: _____

INSTALLED LOCATION: _____ INSTALL DATE: _____

ID	DATE	TIME	TEMP	MAXIMUM DRK		AVERAGE CAL				AVERAGE LED				CHECK EITHER OR BOTH	
				Max: 1-20	PASS ?	Avg: 1-20	CV %	% DIFF PRIOR CL	PASS ?	Avg: 1-20	CV %	% DIFF PRIOR CL	PASS ?	TEST	NEW CONTROL LIMIT
A															
B															
C															
D															
E															
F															
G															
H															
I															
J															
K															
L															
M															
N															
O															
P															
Q															
R															
S															

MicroStar® Reader Standard Measurements Control Limit / Testing Log

LANDAUER®

INSTITUTION: | READER SERIAL #:

INSTALLED LOCATION: | INSTALL DATE:

ID	DATE	TIME	TEMP	MAXIMUM DRK		AVERAGE CAL				AVERAGE LED				CHECK EITHER OR BOTH	
				Max: 1-20	*PASS ?*	Avg: 1-20	CV %	*% DIFF PRIOR CL*	*PASS ?*	Avg: 1-20	CV %	*% DIFF PRIOR CL*	*PASS ?*	TEST	NEW CONTROL LIMIT
A															
B															
C															
D															
E															
F															
G															
H															
I															
J															
K															
L															
M															
N															
O															
P															
Q															
R															
S															

RESOURCE: nanoDot Reading Reproducibility Form

MicroStar® Adapter Reading Reproducibility Test

LANDAUER®

INSTITUTION: _____ READER SERIAL #: _____

INSTALLED LOCATION: _____ INSTALL DATE: _____

TEST DATE: _____

All nanoDot adapters (typically two are received with your unit) should be evaluated by acquiring 10 sequential readings with one high dose nanoDot (> 50 cGy). Optionally the test can be performed 3x or with up to 3 different nanoDots. No Depletion Correction is applied. The acceptance criteria is CV < 1%. Contact LDR Customer Service if the Adapter Reading Reproducibility Test fails.

ADAPTER	1			2		
TEST	1	2	3	1	2	3
NANODOT SN						
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
#10						
AVERAGE						
STDEV						
CV						
PASS/FAIL						

COMMENTS

NEXT

PAGE

MicroStar® Adapter Reading Reproducibility Test

LANDAUER

INSTITUTION:

INSTALLED LOCATION:

READER SERIAL #:

INSTALL DATE:

TEST DATE:

All nanoDot adapters (typically two are received with your unit) should be evaluated by acquiring 10 sequential readings with one high dose nanoDot (> 50 cGy). Optionally the test can be performed 3x or with up to 3 different nanoDots. No Depletion Correction is applied. The acceptance criteria is CV < 1%. Contact LDR Customer Service if the Adapter Reading Reproducibility Test fails.

ADAPTER	1			2		
TEST	1	2	3	1	2	3
NANODOT SN						
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
#10						
AVERAGE						
STDEV						
CV						
PASS/FAIL						

COMMENTS

NEXT

PAGE

MicroStar® Adapter Reading Reproducibility Test

LANDAUER

READER SERIAL #:

INSTALL DATE:

TEST DATE:

TEST PERFORMED BY:

This test was performed:

- ☐ AT READER INSTALLATION
- ☐ DURING ROUTINE QA
- ☐ BECAUSE A NEW ADAPTER WAS RECEIVED

COMMENTS:

microStar Reader QA Program

RESOURCE: Calibration Report Form

MicroStar® Reader Linear Calibration Report - High Dose Range

LANDAUER®

INSTITUTION:	University of Timbuktu	READER SN #:	22222222
INSTALLED LOCATION:	Radiology - Room R120	INSTALL DATE:	1/1/2012

MANDATORY 30 MIN WARMUP ?	PRECALIBRATION READER VERIFICATION			
	20 STANDARD MEASUREMENTS			ADAPTER TEST
	MAX DRK < 20 ?	AVG CAL within ± 5%; CV < 1%	AVG LED within ± 5%; CV < 5%	CV < 1% ?
YES	YES	YES	YES	YES

If all precalibration test criteria are met, proceed to calibrate the reader

CALIBRATION PROCEDURE
- Step 1: Warmup
- Step 2: 20 Standard Measurements
- Step 3: Adapter Test
- Step 4: Perform & Accept Calibration
- Step 5: Post-calibration QC test

RADIATION QUALITY:	80 kVp	NANODOT TYPE:	SCREENED	CALIBRATION FILENAME:	HDLIN_80kVp_08242012
CALIBRATION DATE:	8/14/2012	CALSET SN/ID:	598	CALIBRATION DOSE RANGE:	HIGH (weak beam)
PRIOR CAL. DATE:	6/29/2012	DAYS ELAPSED:	46	NEW CAL ID:	18
CALSET MANUFACTURE DATE:	5/29/2012	DAYS ELAPSED:	77	READ CAL ID:	17

Calibrate Dose Level (mrad)	CV (all readings)	CV < 5% ?	FACTOR (E1 counts/mrad)	LOW DOSE RANGE CALFACTOR (Linear LD Range: 0 to ~12,000 mrad)	PRIOR CALFACTOR	% DIFF
unexposed	n/u	n/u	n/u	2.58	2.612	-1.20%
50000.0	2.1%	YES	2.531			
100000.0	1.8%	YES	2.572			
200000.0	1.3%	YES	2.639			

QC nanoDot Dose Level (mrad)	CV (all readings)	CV < 5% ?	Avg. Dose Reading (mrad)	% DIFF
unexposed	n/u	n/u	2.1	n/u
20000.0	2.4%	YES	20983.0	4.92%
200000.0	1.1%	YES	191223.0	-4.39%

Calibration Verification Status: PASS

Special Instructions

Use this calibration factor for projection x-ray measurements acquired at approximately 80 kVp. Use appropriate correction factors for other kVp. NOTE: Calibration in high dose range does NOT include unexposed dosimeter readings for background subtraction. Post-cal QC Test results should be within +/- 5% (screened nanoDots).

Measurements performed by: _____ Date/Time _____

Calibration Accepted by: _____ Medical Physicist Signature _____ Date/Time _____

MicroStar® Reader Linear Calibration Report - High Dose Range

LANDAUER

INSTITUTION:	University of Timbuktu	READER SN #:	22222222
INSTALLED LOCATION:	Radiology - Room R120	INSTALL DATE:	1/1/2012

MANDATORY 30 MIN WARMUP ?	PRECALIBRATION READER VERIFICATION			
	20 STANDARD MEASUREMENTS			ADAPTER TEST
	MAX DRK < 20 ?	AVG CAL within ± 5%; CV < 1%	AVG LED within ± 5%; CV < 5%	CV < 1% ?
YES	YES	YES	YES	YES

If all precalibration test criteria are met, proceed to calibrate the reader

CALIBRATION PROCEDURE

Step 1: Warmup
Step 2: 20 Standard Measurements
Step 3: Adapter Test
Step 4: Perform & Accept Calibration
Step 5: Post-calibration QC test

RADIATION QUALITY:	80 kVp	NANODOT TYPE:	SCREENED	CALIBRATION FILENAME:	HDLIN_80kVp_08242012
CALIBRATION DATE:	8/14/2012	CALSET SN/ID:	598	CALIBRATION DOSE RANGE:	HIGH (weak beam)
PRIOR CAL. DATE:	6/29/2012	DAYS ELAPSED:	46	NEW CAL ID:	18
CALSET MANUFACTURE DATE:	5/29/2012	DAYS ELAPSED:	77	READ CAL ID:	17

Calibrate Dose Level (mrad)	CV (all readings)	CV < 5% ?	FACTOR (E1 counts/mrad)	LOW DOSE RANGE CALFACTOR (Linear LD Range: 0 to ~12,000 mrad)	PRIOR CALFACTOR	% DIFF
unexposed	n/u	n/u	n/u	2.58	2.612	-1.20%
50000.0	2.1%	YES	2.531			
100000.0	1.8%	YES	2.572			
200000.0	1.3%	YES	2.639			

QC nanoDot Dose Level (mrad)	CV (all readings)	CV < 5% ?	Avg. Dose Reading (mrad)	% DIFF
unexposed	n/u	n/u	2.1	n/u
20000.0	2.4%	YES	20983.0	4.92%
200000.0	1.1%	YES	191223.0	-4.39%

Calibration Verification Status: **PASS**

Special Instructions

Use this calibration factor for projection x-ray measurements acquired at approximately 80 kVp. Use appropriate correction factors for other kVp. NOTE: Calibration in high dose range does NOT include unexposed dosimeter readings for background subtraction. Post-cal QC Test results should be within +/- 5% (screened nanoDots).

Measurements performed by: _____ Date/Time _____

Calibration Accepted by: _____ Medical Physicist Signature _____ Date/Time _____

MicroStar® Reader Linear Calibration Record

LANDAUER

INSTITUTION:	University of Timbuktu	**READER SN #:**	11111111
INSTALLED LOCATION:	Radiation Oncology - Room D101	**INSTALL DATE:**	1/1/2012

MANDATORY 30 MIN WARMUP ?	PRECALIBRATION READER VERIFICATION			
	20 STANDARD MEASUREMENTS			ADAPTER TEST
	MAX DRK < 20 ?	AVG CAL within ± 5%	AVG LED within ± 5%	CV < 1%
YES	YES	YES	YES	YES

If all precalibration test criteria are met, proceed to calibrate the reader

CALIBRATION PROCEDURE

Step 1: Warmup

Step 2: 20 Standard Measurements

Step 3: Adapter Test

Step 4: Perform & Accept Calibration

Step 5: Post-calibration QC test

RADIATION QUALITY:	6 MV (d_{max})			**CALIBRATION FILENAME:**	LIN_6MV_06182012
CALIBRATION DATE:	8/17/2012			**CALIBRATION DOSE RANGE:**	HIGH (Weak Beam)
PRIOR CAL. DATE:	6/17/2012	**DAYS ELAPSED:**	60	**NEW CAL ID:**	24
LAST LINAC QC:	8/7/2012	**DAYS ELAPSED:**	10	**READ CAL ID:**	23

MicroStar Cross-Over-Point (COP) Setting at time of Calib.: 903

Estimated CROSSOVER Dose at stated beam quality: 12-15 nCi

Calibrate Dose Level (cGy)	CV (all readings)	CV < 5% ?	FACTOR (E1 counts/cGy)	HIGH DOSE RANGE CALFACTOR (Linear HD Range: COP to 300 cGy)	PRIOR CALFACTOR	% DIFF
50	2.1%	YES	623.555	637.33	642.38	-0.79%
100	1.8%	YES	635.232			
200	1.3%	YES	648.719			
300	1.1%	YES	641.816			

QC nanoDot Dose Level (cGy)	CV (all readings)	CV < 5% ?	Avg. Dose Reading (cGy)	% DIFF
50	3.8%	YES	48.8	-2.40%
150	2.4%	YES	154.1	2.73%
300	1.1%	YES	302.8	0.93%

Calibration Verification Status: **PASS**

Special Instructions

Use this calibration factor for surface dose measurements obtained using a 6 MV photon beam and where doses are expected to fall within 15 cGy and 300 cGy. NOTE: Perform Daily reader QC + Weekly Calibration Verification with a recently irradiated constancy QC nanoDot per QA protocol.

Measurements performed by: _____ Date/Time _____

Calibration Accepted by: _____ Medical Physicist Signature _____ Date/Time _____

microStar Reader QA Program

RESOURCE: Calibration Log Sheet

MicroStar® Reader Calibration Factor Log LANDAUER®

INSTITUTION: | READER SERIAL #:

INSTALLED LOCATION: | INSTALL DATE:

BEAM QUALITY: 6 MV (d_{max}) | CALIBRATION PROTOCOL: LINEAR | DOSE RANGE: HIGH (>15 cGy)

ID	DATE OF CALIBRATION	TIME	TEMP	CALSET ID / SN / LABEL	CALSET AGE (DAYS)	PRIOR REFERENCE CALIBRATION FACTOR (Counts/cGy)	NEW CALIB NAME (ex: LD_80kVp_09192012)	NEW CALIB ID	NEW CALIBRATION FACTOR (Counts/cGy)	% DIFF NEW vs REF	CALIBRATION ACCEPTED FOR USE STARTING
A											
B											
C											
D											
E											
F											
G											
H											
I											
J											
K											
L											
M											
N											
O											
P											
Q											
R											

MicroStar® Reader Calibration Factor Log

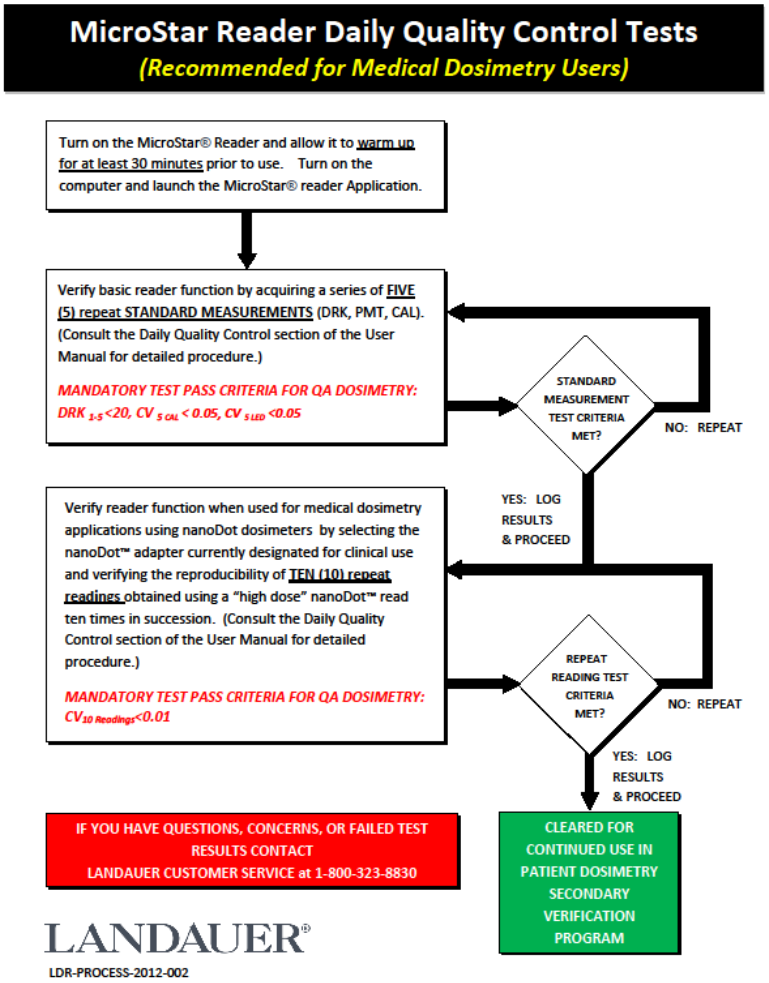
LANDAUER®

INSTITUTION:		**READER SERIAL #:**	
INSTALLED LOCATION:		**INSTALL DATE:**	
BEAM QUALITY:	6 MV (d_{max})	**CALIBRATION PROTOCOL:** LINEAR	**DOSE RANGE:** HIGH (>15 cGy)

ID	DATE OF CALIBRATION	TIME	TEMP	CALSET ID / SN / LABEL	CALSET AGE (DAYS)	PRIOR REFERENCE CALIBRATION FACTOR (Counts/cGy)	NEW CALIB NAME (ex: LD_80kVp_09192012)	NEW CALIB ID	NEW CALIBRATION FACTOR (Counts/cGy)	% DIFF NEW vs REF	CALIBRATION ACCEPTED FOR USE STARTING
A											
B											
C											
D											
E											
F											
G											
H											
I											
J											
K											
L											
M											
N											
O											
P											
Q											
R											

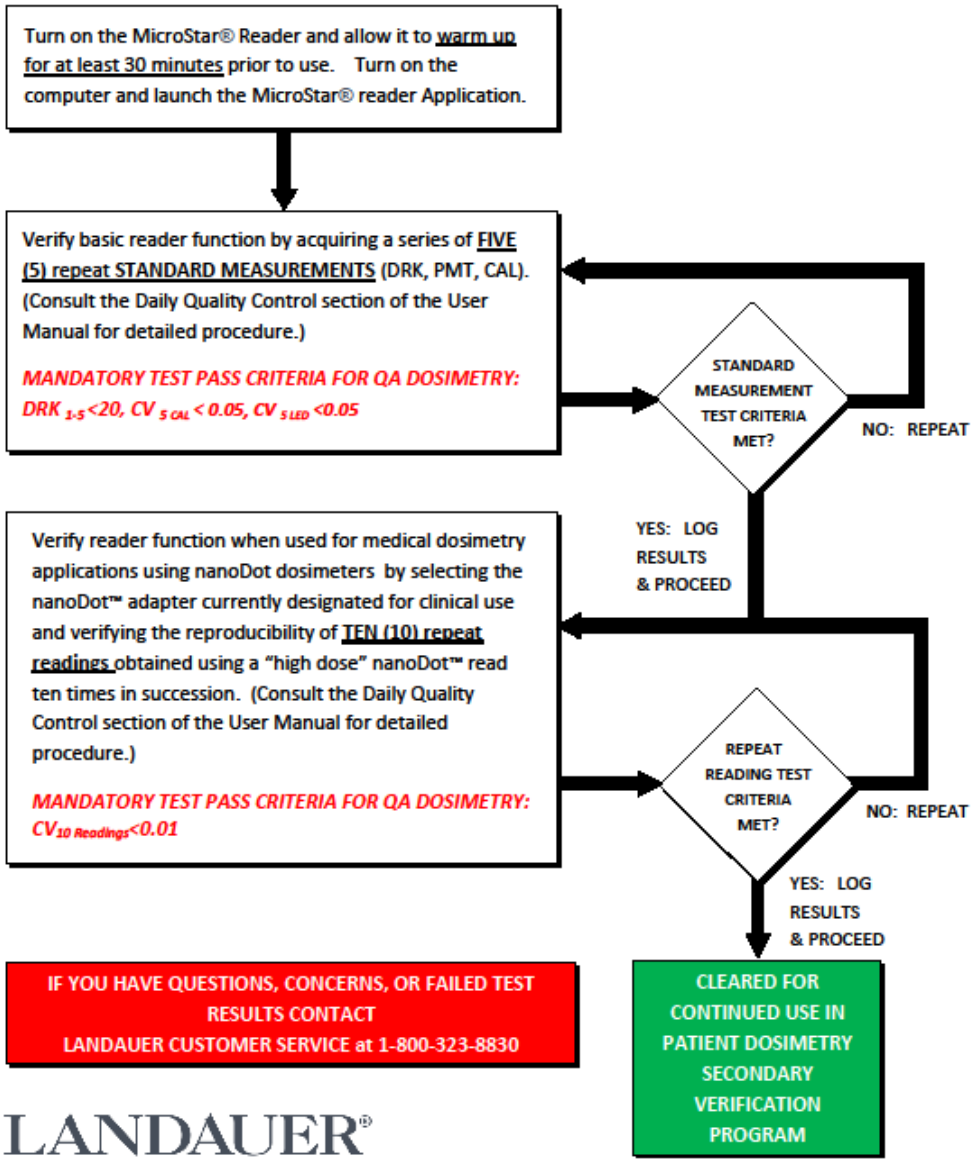
microStar Reader QA Program

RESOURCE: Daily QC Testing Flow Chart



MicroStar Reader Daily Quality Control Tests

(Recommended for Medical Dosimetry Users)



LANDAUER®

LDR-PROCESS-2012-002

microStar Reader QA Program

RESOURCE: Daily QC Form

MicroStar® Reader Daily Quality Control LANDAUER®

INSTITUTION: _____ READER SERIAL #: _____

INSTALLED LOCATION: _____ INSTALL DATE: _____

ID	TEST DATE	MAXIMUM DRK		AVERAGE CAL			AVERAGE LED			NANODOT/ADAPTER READING REPEATABILITY TEST			
		Max: 1-5	PASS ?	Avg: 1-5	CV %	PASS ?	Avg: 1-5	CV %	PASS ?	DOT SN / Adapter	Avg. 1-10 (Counts or cGy)	CV %	PASS ?
A													
B													
C													
D													
E													
F													
G													
H													
I													
J													
K													
L													
M													
N													
O													
P													
Q													
R													
S													

CONTROL LIMITS: MAX DRK < 20 ; CAL LOWER: _____ CAL UPPER: _____; LED LOWER: _____ LED UPPER:_____ : REPEAT CV ≤ 1%

MicroStar® Reader Daily Quality Control

LANDAUER

INSTITUTION: _____ READER SERIAL #: _____

INSTALLED LOCATION: _____ INSTALL DATE: _____

ID	TEST DATE	MAXIMUM DRK		AVERAGE CAL			AVERAGE LED			NANODOT/ADAPTER READING REPEATABILITY TEST			
		Max: 1-5	PASS ?	Avg: 1-5	CV %	PASS ?	Avg: 1-5	CV %	PASS ?	DOT SN / Adapter	Avg. 1-10 (Counts or cGy)	CV %	PASS ?
A													
B													
C													
D													
E													
F													
G													
H													
I													
J													
K													
L													
M													
N													
O													
P													
Q													
R													
S													

CONTROL LIMITS: MAX DRK < 20 ; CAL LOWER: _____ CAL UPPER: _____; LED LOWER: _____ LED UPPER:_____ : REPEAT CV ≤ 1%

LANDAUER

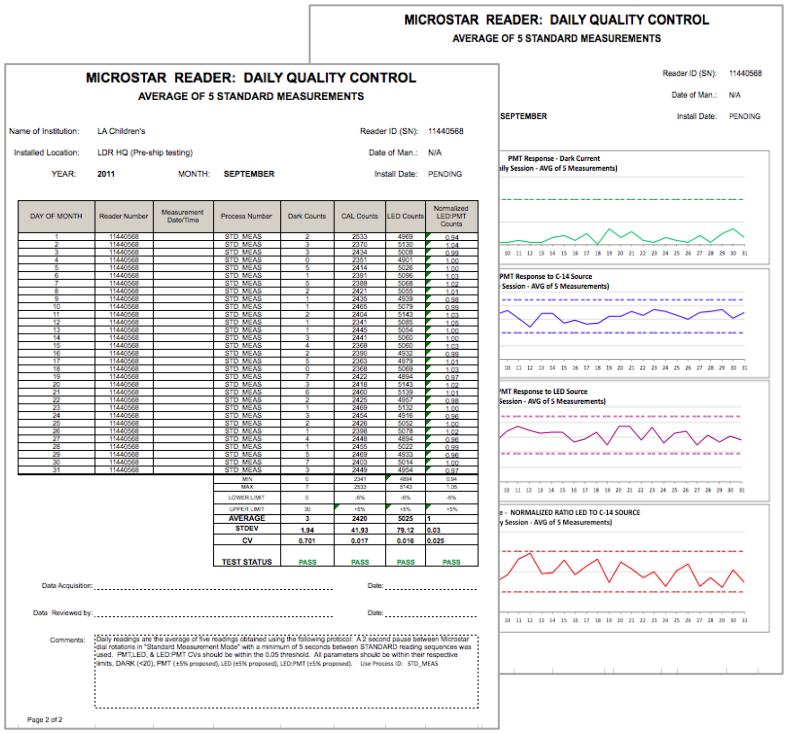
microStar Reader QA Program

Monitoring Reader Performance Trends

- Obtain a series of FIVE (5) Standard Measurements
- Export Data from MicroStar to Excel
- Verify results are within limits

  (DRK < 20, CV_{CAL} & CV_{LED} < 0.05)
- Record result on Daily QC form
- Add data to Excel Trend Report
- Monitor trends

Printable Retrospective Daily Standard Measurements Trend Report



MICROSTAR READER: DAILY QUALITY CONTROL

AVERAGE OF 5 STANDARD MEASUREMENTS

Name of Institution: LA Children's — Reader ID (SN): 11440568

Installed Location: LDR HQ (Pre-ship testing) — Date of Man.: N/A

YEAR: 2011 — MONTH: SEPTEMBER — Install Date: PENDING

DAY OF MONTH	Reader Number	Measurement Date/Time	Process Number	Dark Counts	CAL Counts	LED Counts	Normalized LED:PMT Counts
1	11440568		STD_MEAS	2	2533	4969	0.94
2	11440568		STD_MEAS	3	2370	5130	1.04
3	11440568		STD_MEAS	3	2434	5018	0.99
4	11440568		STD_MEAS	0	2351	4851	1.00
5	11440568		STD_MEAS	5	2414	5026	1.00
6	11440568		STD_MEAS	1	2391	5096	1.03
7	11440568		STD_MEAS	5	2388	5068	1.02
8	11440568		STD_MEAS	2	2421	5055	1.01
9	11440568		STD_MEAS	1	2435	4939	0.98
10	11440568		STD_MEAS	1	2465	5079	0.99
11	11440568		STD_MEAS	2	2404	5143	1.03
12	11440568		STD_MEAS	1	2341	5083	1.05
13	11440568		STD_MEAS	1	2449	5074	1.00
14	11440568		STD_MEAS	3	2441	5060	1.00
15	11440568		STD_MEAS	4	2368	5069	1.03
16	11440568		STD_MEAS	2	2390	4932	0.99
17	11440568		STD_MEAS	5	2363	4979	1.01
18	11440568		STD_MEAS	0	2368	5069	1.03
19	11440568		STD_MEAS	7	2422	4894	0.97
20	11440568		STD_MEAS	3	2418	5143	1.02
21	11440568		STD_MEAS	6	2405	5139	1.01
22	11440568		STD_MEAS	2	2429	4957	0.98
23	11440568		STD_MEAS	1	2469	5132	1.00
24	11440568		STD_MEAS	3	2454	4976	0.96
25	11440568		STD_MEAS	2	2428	5052	1.00
26	11440568		STD_MEAS	1	2398	5078	1.02
27	11440568		STD_MEAS	4	2448	4894	0.96
28	11440568		STD_MEAS	1	2455	5022	0.99
29	11440568		STD_MEAS	5	2469	4933	0.96
30	11440568		STD_MEAS	1	2403	5014	1.00
31	11440568		STD_MEAS	3	2449	4954	0.97
			MIN	0	2341	4894	0.94
			MAX	7	2533	5143	1.05
			LOWER LIMIT	0	-5%	-5%	-5%
			UPPER LIMIT	20	+5%	+5%	+5%
			AVERAGE	3	2420	5025	1
			STDEV	1.94	41.93	79.12	0.03
			CV	0.701	0.017	0.016	0.025
			TEST STATUS	PASS	PASS	PASS	PASS

Data Acquisition: ..... Date: .....

Data Reviewed by: ..... Date: .....

Comments: Daily readings are the average of five readings obtained using the following protocol: A 2 second pause between Microstar dial rotations in "Standard Measurement Mode" with a minimum of 5 seconds between STANDARD reading sequences was used. PMT:LED, & LED:PMT CVs should be within the 0.05 threshold. All parameters should be within their respective limits. DARK (<20), PMT (±5% proposed), LED (±5% proposed), LED:PMT (±5% proposed). Use Process ID: STD_MEAS

Page 2 of 2

MICROSTAR READER: DAILY QUALITY CONTROL

AVERAGE OF 5 STANDARD MEASUREMENTS

Reader ID (SN): 11440568

Date of Man.: N/A

SEPTEMBER — Install Date: PENDING

PMT Response - Dark Current

ily Session - AVG of 5 Measurements)

PMT Response to C-14 Source

Session - AVG of 5 Measurements)

MT Response to LED Source

Session - AVG of 5 Measurements)

- NORMALIZED RATIO LED TO C-14 SOURCE

y Session - AVG of 5 Measurements)

MICROSTAR READER: QUALITY CONTROL

TRENDS IN AVERAGE OF 5 DAILY STANDARD MEASUREMENTS

Name of Institution: XYZ Medical Center Reader ID (SN): 999999

Installed Location: LDR HQ (Pre-ship testing) Date of Man.: N/A

YEAR: **2011** MONTH: **SEPTEMBER** Install Date: PENDING

DAY OF MONTH	Reader Number	Measurement Date/Time	Process Number	AVG. Dark Counts	AVG. CAL Counts	AVG. LED Counts	AVG Normalized LED:PMT Counts
1	11440568		STD_MEAS	2	2533	4969	0.94
2	11440568		STD_MEAS	3	2370	5130	1.04
3	11440568		STD_MEAS	3	2434	5008	0.99
4	11440568		STD_MEAS	0	2351	4901	1.00
5	11440568		STD_MEAS	5	2414	5026	1.00
6	11440568		STD_MEAS	1	2391	5096	1.03
7	11440568		STD_MEAS	5	2388	5068	1.02
8	11440568		STD_MEAS	2	2421	5055	1.01
9	11440568		STD_MEAS	1	2435	4939	0.98
10	11440568		STD_MEAS	1	2465	5079	0.99
11	11440568		STD_MEAS	2	2404	5143	1.03
12	11440568		STD_MEAS	1	2341	5085	1.05
13	11440568		STD_MEAS	1	2445	5054	1.00
14	11440568		STD_MEAS	3	2441	5060	1.00
15	11440568		STD_MEAS	4	2368	5060	1.03
16	11440568		STD_MEAS	2	2390	4932	0.99
17	11440568		STD_MEAS	5	2363	4979	1.01
18	11440568		STD_MEAS	0	2368	5069	1.03
19	11440568		STD_MEAS	7	2422	4894	0.97
20	11440568		STD_MEAS	3	2450	5036	0.99
21	11440568		STD_MEAS	6	2418	4923	0.98
22	11440568		STD_MEAS	2	2406	4909	0.98
23	11440568		STD_MEAS	1	2425	5062	1.01
24	11440568		STD_MEAS	3	2432	5137	1.02
25	11440568		STD_MEAS	2	2407	4934	0.99
26	11440568		STD_MEAS	1	2375	4951	1.00
27	11440568		STD_MEAS	4	2467	4910	0.96
28	11440568		STD_MEAS	1	2416	5041	1.00
29	11440568		STD_MEAS	5	2410	4897	0.98
30	11440568		STD_MEAS	7	2469	5009	0.98
31	11440568		STD_MEAS	3	2386	4995	1.01
			MIN	0	2341	4894	0.94
			MAX	7	2533	5143	1.05
			LOWER LIMIT	0	-5%	-5%	-5%
			UPPER LIMIT	20	+5%	+5%	+5%
			AVERAGE	**3**	**2413**	**5011**	**1.000**
			STDEV	**1.94**	**40.56**	**76.48**	**0.02**
			CV	**0.701**	**0.017**	**0.015**	**0.024**
			TEST STATUS	**PASS**	**PASS**	**PASS**	**PASS**

Data Acquisition: ..... Date: .....

Data Reviewed by: ..... Date: .....

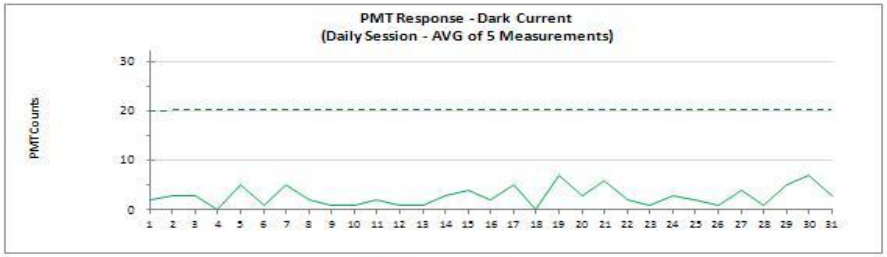
MICROSTAR READER: QUALITY CONTROL

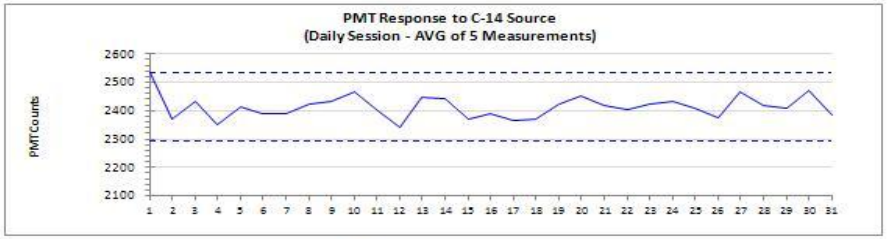
TRENDS IN AVERAGE OF 5 DAILY STANDARD MEASUREMENTS

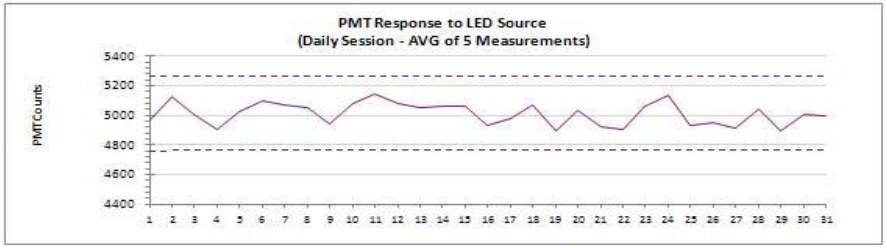
Name of Institution: XYZ Medical Center Reader ID (SN): 999999

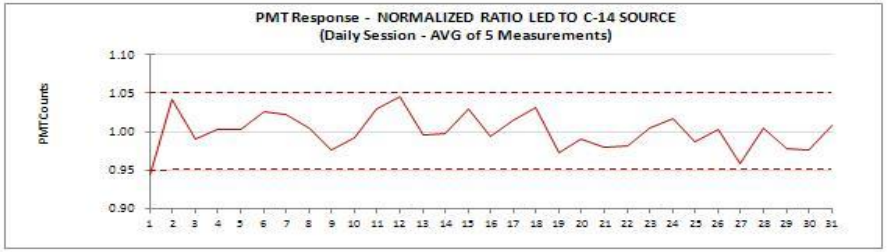
Installed Location: LDR HQ (Pre-ship testing) Date of Man.: N/A

YEAR: **2011** MONTH: **SEPTEMBER** Install Date: PENDING









RESOURCE: QA Forms - Printable (.PDF) or Electronic (.XLS)

① High Precision MicroStar Standard Measurement Record Sheet
② MicroStar Standard Measurement Control Limits Log
③ nanoDot Reading Reproducibility Record Sheet
④ Linear Calibration Worksheet
⑤ Calibration Log Sheet
⑥ Non-Linear Calibration Worksheet
⑦ Non-Linear Calibration Log Sheet
⑧ Reader Daily Quality Control Log Sheet
⑨ Calibration Set Usage Log Sheet

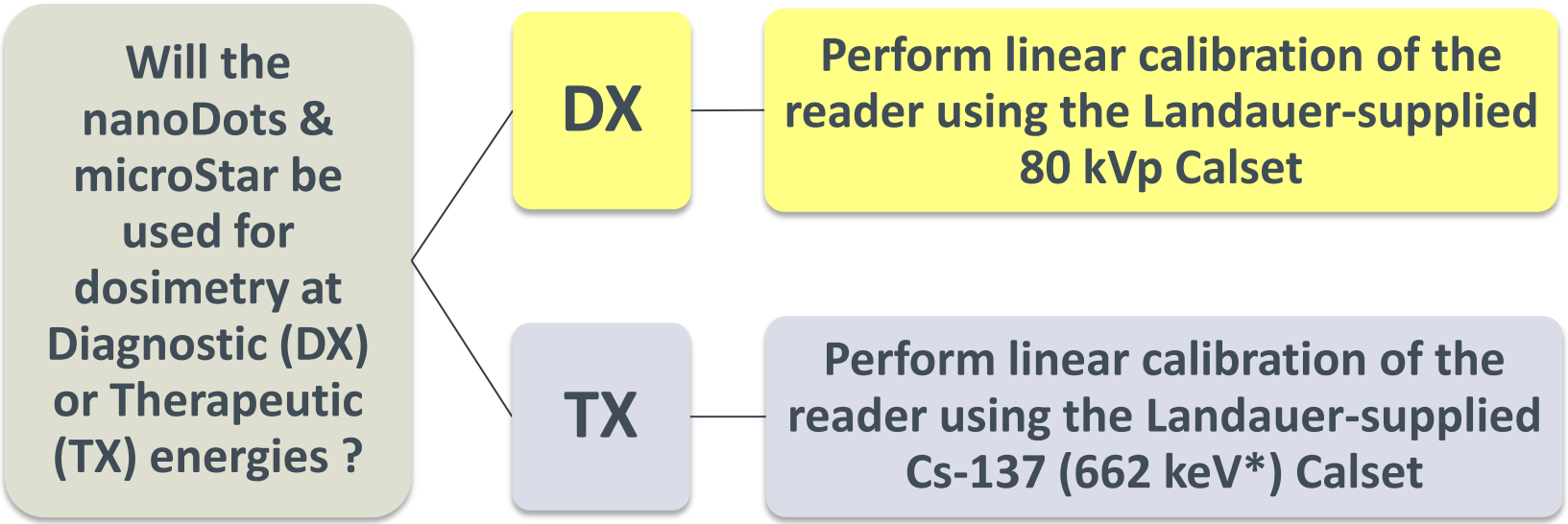
microStar Reader QA Program

RESOURCE: QA Report Spreadsheets

① High Precision Standard Measurements Test: 20 cycles
② Daily QC Standard Measurements Trend: 5 cycles
③ nanoDot/Adapter Reading Reproducibility
④ Linear Calibration Verification
⑤ Non-Linear Calibration Verification
⑥ Trends in Computed Calibration Factors
⑦ Trends in Constancy nanoDot readings (optional)
⑧ Post-Calibration/QC reading trends (weekly – monthly)

Future Calset Options for Medical Dosimetry Users

Calibration Using Landauer NIST-Traceable Reference Dosimeters



* The 662 keV TX therapy provides a set of reference dosimeters irradiated under controlled conditions that can be used to verify the MicroStar performance independent of clinical systems but should not be used for clinical dosimetry.

RESOURCE: Landauer-supplied 80 kVp nanoDot Calset

NOTE: New Calset Configuration – Available 1st quarter 2013

CALIBRATION SET	Prior Dose Levels (cGy*)	New Dose Levels (cGy*)	Dose Range
	Unexposed	**Unexposed**	**Low**
	0.5	**1.0**	**Low**
	3.0	**10.0**	**Low**
	50.0	**50.0**	**High**
	100.00	**100.00**	**High**
POST-CAL QC SET	Prior Dose Levels (cGy*)	**New Dose Levels (cGy*)**	**Dose Range**
	Unexposed	**Unexposed**	**Low**
	1.0	**1.0**	**Low**
	-	**100.00**	**High**

Unit Conversion: 1 cGy = 1000 mrad; Dose Range designation when Cross-Over-Point (COP) default setting is unchanged.

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microStar Reader QA Program

RESOURCE: Landauer-supplied 662 keV nanoDot Calset

NOTE: New Calset Configuration – Available 1st quarter 2013

CALIBRATION SET	Dose (cGy*)	Dose Range	Dose (cGy*)	Dose Range
	Unexposed	Low		
	1.0	Low	50.0	High
	5.0	Low	100.0	High
	10.0	Low	200.0	High
POST-CAL QC SET	**Dose (cGy*)**	**Dose Range**	**Dose (cGy*)**	**Dose Range**
	Unexposed	Low		
	1.0	Low	50.0	High
	10.0	Low	200.0	High

Unit Conversion: 1 cGy = 1000 mrad; Dose Range designation when Cross-Over-Point (COP) default setting is unchanged.

RESOURCE: Bibliography of Peer-Reviewed Publications

Examples:

Jursinic PA, “Changes in optically stimulated luminescent dosimeter (OSLD) dosimetric characteristics with accumulated dose.”, Med Phys 37(1): 132-140, (2010).

Jursinic PA, “In vivo dosimetry with optically stimulated luminescent dosimeters, OSLDs, compared to diodes; the effects of buildup cap thickness and fabrication material, Med Phy 38(10), 5432-5440,(2011).

SCHEDULED PREVENTIVE MAINTENANCE & SERVICE

LANDAUER®

Landauer Customer Service Contact Info

800-561-2708

or:

inlightcustserv@landauerinc.com

TROUBLESHOOTING

SUPPORT

microStar Reader QA Program

Recommended approach to trouble-shooting

1. **Consult the Landauer User Manual**
2. **Consult the MicroStar MicroSite Frequently Asked Question (FAQs) section**
3. **Contact Landauer Customer Service**

   by phone: 800-561-2708
   by email: inlightcustserv@landauerinc.com

How your inquiry will be routed:

General Issues:	**Customer Service Rep**
Mechanical/Software:	**InLight Product Specialist**
Advanced Applications:	**Medical or Health Physicist**

W-I-P: Trouble-shooting and Clinical Application Videos

A family of training videos specific to medical dosimetry users & medical dosimetry clinical applications are being planned.

Watch for announcements on the Landauer MicroSite:

http://solutions.landauer.com/microstar

DOCUMENTING READER ISSUES

MicroStar® Reader Incident Report (Page 1 of 2) LANDAUER

INSTITUTION: _____ **READER SERIAL #:** _____

INSTALLED LOCATION: _____ **INSTALL DATE:** _____

CATEGORY OF PROBLEM (PROVIDE ADDITIONAL DETAILS ON PAGE 2)

- ☐ READER HARDWARE
  - ☐ Misfeed
  - ☐ Tray/nanoDot Jam
- ☐ ADAPTER
- ☐ NANODOT
- ☐ MICROSTAR SOFTWARE
- ☐ MICROSTAR DATABASE
- ☐ CONNECTIVITY / INTEGRATION

IS THIS THE FIRST OCCURRENCE ?

- ☐ YES
- ☐ NO

WAS CUSTOMER SERVICE NOTIFIED ?

- ☐ YES
- ☐ NO

WAS THE RESPONSE TIME ACCEPTABLE ?

- ☐ YES
- ☐ NO

WERE OPERATIONS IMPACTED ?

- ☐ YES
- ☐ NO

WAS THE PROBLEM RESOLVED ?

- ☐ YES
- ☐ NO

ADDITIONAL COMMENTS:

ESTIMATED DOWNTIME: ☐ HOURS ☐ DAYS

CONTACT LANDAUER CUSTOMER SERVICE AT: 1-800-323-8830

MicroStar® Reader Incident Report (Page 2 of 2) LANDAUER

INSTITUTION: | **READER SERIAL #:**

INSTALLED LOCATION: | **INSTALL DATE:**

DATE/TIME OF INCIDENT: | **INCIDENT REPORTED BY:** | **DATE/TIME REPORTED:**

Detailed description of problem:

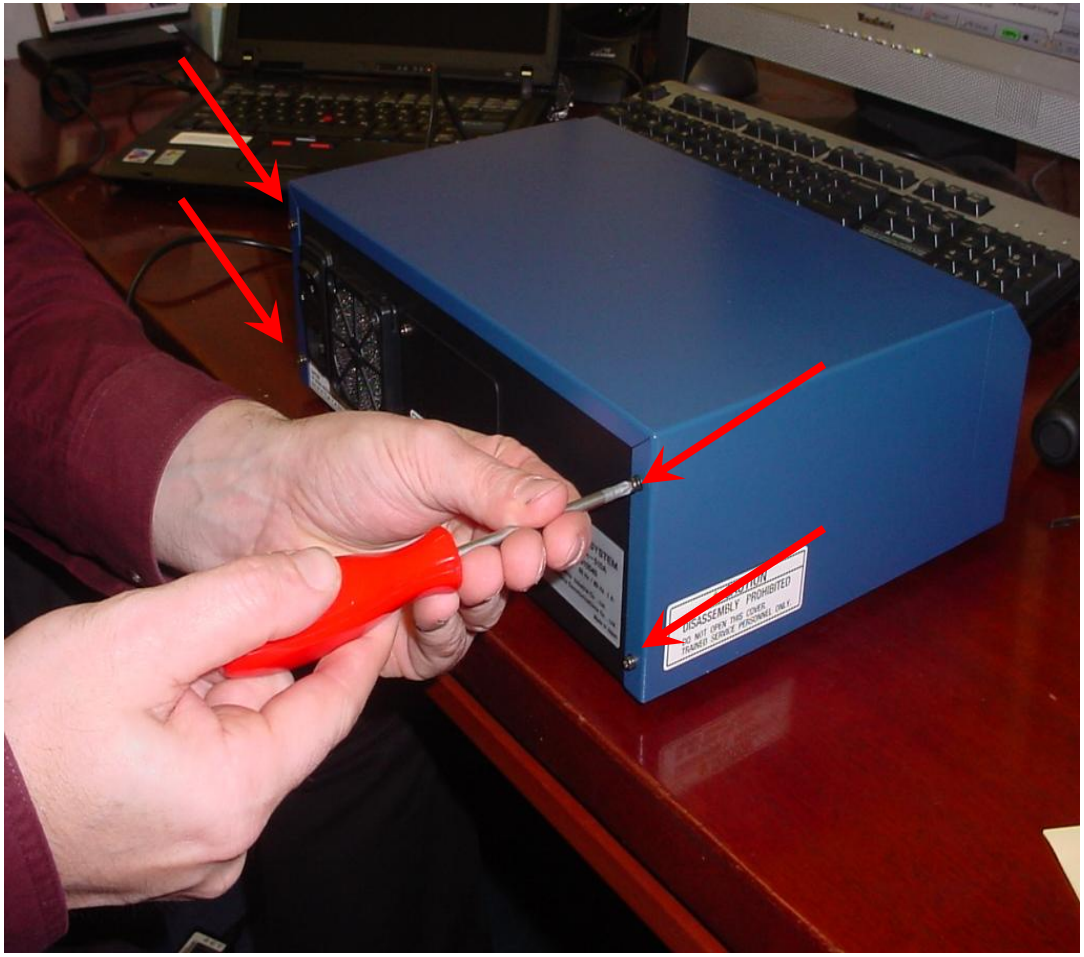
Describe how the problem was resolved:

Incident Report Reviewed by: | **Date of Review:**

CONTACT LANDAUER CUSTOMER SERVICE AT: 1-800-323-8830

microStar Reader QA Program

Trouble-Shooting: WARNING



The Landauer User Manual includes instructions on how to perform simple mechanical trouble-shooting.

You are not obligated to perform these mechanical interventions. You have the option of sending your reader back for repair by contacting customer service at:
1-800-561-2708

If you attempt to un-jam the reader, follow all instructions.

TURN OFF AND UNPLUG reader before opening!!!

How to Ensure Accuracy in Medical Dosimetry Results

BEST PRACTICES:

- ✓ Implement the MicroStar QA Program and monitor reader performance trends. Recalibrate the reader as indicated by periodic Post-Cal QC verification tests.
- ✓ Verify the correct sensitivity is displayed when scanning nanoDot serial numbers prior to reading.
- ✓ When reading nanoDots, note the form of the dose calculation formula on the reading screen and that the values used in the calculation are correct.
- ✓ Always use the average of 3-4 readings to calculate an average estimate of dose for medical dosimetry applications, never rely on a single reading.
- ✓ Manually verify any suspect dose results.

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microStar Reader QA Program

Recommended QA Test Frequency

DESCRIPTION OF TEST	FREQUENCY
STANDARD MEASUREMENTS TEST (5)	DAILY
NANODOT READING REPRODUCIBILITY	DAILY
NANODOT READING CONSTANCY	DAILY (OPTIONAL)
CALIBRATION	INSTALLATION / AFTER REPAIR / AS INDICATED
ESTABLISH/VALIDATE CONTROL LIMITS	AT INSTALLATION / AFTER REPAIR
INSTALLATION TESTS	AT INSTALLATION / ANNUALLY / AFTER REPAIR
MONITORING OF TRENDS IN QA TEST RESULTS	ONGOING

FREQUENTLY ASKED QUESTIONS (FAQs)

Frequently Asked Questions (FAQs)

FAQ #1: I have v2.0 software. Is it really necessary that I upgrade to v4.3 ?

There are a substantial number of benefits to upgrading to the v4.3 software, some of which are:

1. The nanoDot serial number is now automatically decoded, minimizing errors resulting from the possible use of an incorrect default nanoDot sensitivity.
2. There are new functions that facilitate the implementation of the new MicroStar Quality Assurance Program.
3. There are significant new features including the ability to save report export templates, to create site-specific demographics fields and security features.
4. Most importantly – at the end of Q1 2013, the v2.0 software will no longer be supported.

FAQ #2: Is the MicroStar Quality Assurance Program mandatory ?

Landauer recognizes that individual medical physicists may opt to deviate from or adapt some of the recommended QA program recommendations as they customize their reader QA program to their specific application.

However, Landauer strongly recommends that the default installation protocol and basic reader QA regimen be followed in order to achieve optimal results using the microStar reader.

Furthermore, failure to perform the recommended installation protocol and QA tests to verify compliance with mandatory control limits will make it less likely to achieve the accuracy levels referenced on Landauer's nanoDot specification sheet and consequently Landauer cannot be held responsible for results obtained when the reader is operated under those conditions.

Frequently Asked Questions (FAQs)

FAQ #3: After installing v4.3, immediately after performing a reader calibration and then the post-calibration verification by performing a test dosimeter (QC) reading on the reading screen, the calibration factor displayed in the dose computation formula is displayed as "0" but the computed dose displayed appears to be correct. Also, the problem goes away with subsequent readings. Is this normal ?

This is a known defect in this initial release of the v4.3 software. Rest assured that the correct value of the calibration factor is being used in the dose calculation formula which you can verify by performing a second reading. Since the standard protocol for medical dosimetry readings is to repeat the reading four times, this software defect is not expected to significantly impact users but will be addressed at the first opportunity in subsequent updates of the v4.3 software.

Frequently Asked Questions (FAQs)

FAQ #4: My Average of 5 Standard Measurement Daily QC results measured over a year show a CAL result that is trending down by about 10% in comparison with the start of the year, while the PMT trend remains fairly constant. Is this normal ?

Normally the CAL readings which reflect PMT response to a long-lived C-14 source should be very stable over the course of a year due to the long half-life of C-14 and if they did show a consistent downtrend that was due to decreased PMT response, it would be likely that the LED readings would show the same general trends. The fact that the CAL & LED trends show differing trend result implies there is something intrinsic to the CAL data acquisition that might impact those results alone. A likely explanation might be a buildup of dirt/dust on the swing arm filter that is otherwise retracted for LED readings. The recommended corrective action is to clean the filter. If cleaning the filter does not resolve the problem, the reader should be returned to Landauer for preventive maintenance.

Frequently Asked Questions (FAQs)

FAQ #5: My nanoDot/Adapter Reading Repeatability test is consistently yielding CV results above 1.0%, e.g. 1.5-2.1 % but this test was yielding acceptable results until recently. What is the recommended course of action ?

The consistency of nanoDot readings is highly dependent on both the reader operating stability which is reflected in the Standard Measurement results AND the mechanical stability of the nanoDot feed mechanism which is highly dependent on the state of the nanoDot adapter. First verify that the Daily 5 Standard Measurement QC Test results are acceptable. If so, repeat the nanoDot/Adapter Reading Repeatability test with the backup adapter (you should have received two with your reader). If the test passes, install the new adapter and label the prior adapter as defective and remove it from clinical use. Contact Landauer CS to order an additional backup adapter. In the event the adapter change does not resolve the problem, call Landauer Customer Service for additional guidance.

Frequently Asked Questions (FAQs)

FAQ #6: I notice that when I export dosimetry data + calibrations to MicroSoft Excel, that the magnitude of the calibration factor is always the same regardless of the selected units prior to export. However, the label on the calibration worksheet agrees with the chosen units for data export. What is going on ?

This is a recently discovered v4.3 software defect that is still being investigated. The calibration factor is being exported in units of mrad ALWAYS even when other export units are selected. The label of the calibration worksheet is therefore only correct when mrad units have been selected prior to export. There are TWO options:

1. Export data in mrad units ALWAYS to avoid this issue.
2. If there is an absolute need to export data in other, for instance cGy units, proceed with the export and go to the Calibration tab in the exported file and compare the magnitude of the calibration factors with that recorded in the MicroStar software and adjust the magnitude in Excel so that it is in agreement while also verifying that the worksheet labeled units are correct, in this case “Calibration (cGy)”.

For additional FAQs, news & product updates, consult the Landauer MicroSite at:

http://solutions.landauer.com/microstar

QUESTIONS
OR
COMMENTS
?

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NEED ASSISTANCE ?

For specific questions regarding your microStar® dosimetry system, please contact Landauer's InLight® customer service division at:

800-561-2708

or:

inlightcustserv@landauerinc.com

A Landauer technical representative will be happy to assist you and will direct your questions to a medical or health physicist, as necessary.